THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXXII. No. 807.] LONDON, OCTOBER 29, 1878. [30th Year.] Price 6d.

COOKE BROS.

See Page 650.

26, 27, & 28, FENCHURCH ST.,

LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.

Several Prize Medals. Established over 20 Years.

These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.

The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov. 2, 1866.*

Supplied, mixed ready for use, or in paste, as desired.

TORBAY PAINT COMPANY.

Proprietors: STEVENS & CO.,
21, GREAT WINCHESTER STREET, LONDON.
Works: BRIXHAM, TORBAY.

THOMAS PROUD,
BROOKFIELD GAS APPARATUS WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.

CONTRACTOR FOR
LAYING MAINS
FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.

JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,

Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.

COWEN'S GARESFIELD COALS.

Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.

Head London Office:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
Manufacturers of
WET AND DRY GAS-METERS,
Licensees and Manufacturers of
HUNT'S
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.

Established 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
Manufacturers of
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.

Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.

J. & H. ROBUS,
BUILDERS AND CONTRACTORS
FOR THE
ERECTION AND REBUILDING OF GAS AND WATER WORKS.
ESTIMATES FREE
FOR MAIN-LAYING AND GENERAL REPAIRS

RETORT-SETTING A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS guaranteed to carbonize a large amount of coal with a small per cent. of fuel.

N.B.—All kinds of Fire Goods, &c., kept in stock for immediate delivery. Orders promptly attended to.

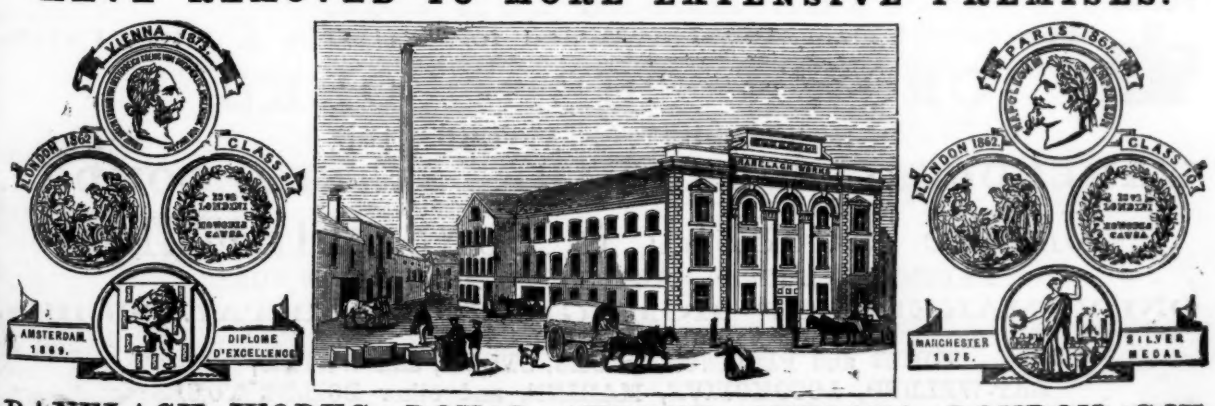
BELL GREEN, CATFORD, S.E.

THE
NITSHILL COMPANY'S
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.

AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.

CHANGE OF ADDRESS.

GEORGE GLOVER AND CO.,
DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES:



RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

SILVER MEDAL, PARIS EXHIBITION, 1867.

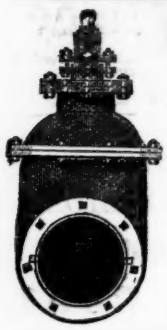
LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,
AND
COOMBS WOOD TUBE-WORKS, HALESOWEN,
MANUFACTURERS OF
WROUGHT-IRON TUBES AND FITTINGS,
AND
LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES,
UP TO FOUR FEET IN DIAMETER.

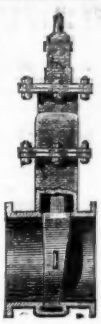
London Offices: No. 4, Cloak Lane, Queen Street, E.C.
Warehouses: London, Liverpool, Manchester, and Lille.

JOSEPH AIRD,

WELLINGTON TUBE-WORKS, TIPTON, STAFFORDSHIRE,
MANUFACTURER OF
EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
CORE BARS, COILS, COCKS (IRON OR BRASS),
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.



C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

MIDLAND IRON-WORKS,
DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,
ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.
MANUFACTURERS OF EVERY DESCRIPTION OF
GAS APPARATUS;
CONTRACTORS FOR THE
ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

TRADE MARK

THE MEDAL FOR 1862.
The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.
WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,
ONLY MAKERS OF HOMOGENEOUS METAL TUBES.
MANUFACTURERS OF
TUBES and FITTINGS for GAS, STEAM, and WATER;
LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;
HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;
GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

RICH. H. TAUNTON & HAYWARD,

MANUFACTURERS OF

WROUGHT-IRON GAS, WATER, & STEAM TUBES & FITTINGS,

STAR TUBE WORKS, HENEAGE STREET, BIRMINGHAM.

HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

PRICES ON APPLICATION.

ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.

SULPHATE AMMONIA.

R. W. WALLACE & CO.,

60, MARK LANE, LONDON, E.C.,

Are Buyers of SULPHATE AMMONIA in Large or Small Quantities, or Sell on Commission for Gas Companies and Makers.

PLANT ERECTED ON THE LATEST AND MOST APPROVED PRINCIPLE.

AGENTS to THE GASLIGHT AND COKE COMPANY, LONDON, for the SALE of SULPHATE AMMONIA. Works: BECKTON.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL: Back Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-made Retorts have now been in *actual work* nearly 1000 days, and are yet in good order. References on application.

July 2, 1877.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

THE AMERICAN GAS-LIGHT JOURNAL.

A. M. CALLENDER & CO., Proprietors. **G. WARREN DRESSER, Editor.**

Issued Semi-Monthly at No. 42 Pine Street, New York City.

This Journal is especially devoted to Gas Engineering and Manufacture, and is the official organ of the AMERICAN GAS-LIGHT ASSOCIATION, and the NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Subscriptions at $3.50 per annum, post paid, to Great Britain, may be made direct by forwarding Post Office Money Order or Draft to the above address. Rates of advertisement, $2.00 an inch. Special rates for larger spaces.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

A recent extensive development of the Collieries enables us to offer increased supplies.

JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—

"Warrington Gaslight and Coke Company,
Offices, Mersey Street, Warrington, April 23, 1877.

"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

"The average of Nine samples gives a yield of **12,500** cubic feet of **15½**-Candle Gas, being equivalent to **664** lbs. of sperm per ton, and **1420** lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

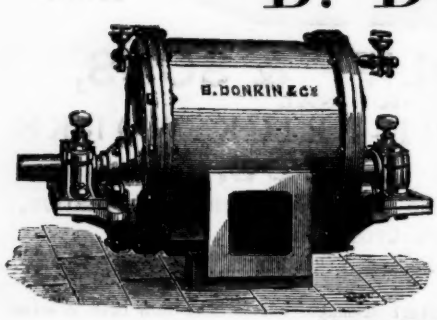
"Yours truly, "JAMES PATERSON."

Full particulars will be sent on application to us—address as above.

J. BEALE'S NEW PATENT GAS EXHAUSTERS

MANUFACTURED SOLELY BY

B. DONKIN & Co.



These Exhausters have but one solid slide, which ensures less wear and friction, and thus fewer repairs are necessary. They are made with two outside bearings and with all latest improvements.

MESSRS. B. D. & Co. ALSO MAKE

STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS.
IMPROVED GAS-VALVES.
VALVES FOR AMMONIACAL LIQUOR, TAR, and HYDRAULIC MAINS.
VALVES FOR SPECIAL PURPOSES, WITH COLUMNS, SCALES, AND GAUGES.
STEAM, GAS THROTTLE, AND BYE-PASS VALVES.
SCREW WATER-VALVES, &c.

LISTS, PRICES, AND INFORMATION ON APPLICATION.

WORKS: 55a, BLUE ANCHOR ROAD, BERMONDSEY, LONDON, S.E.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

J. T. B. PORTER & CO.,

GAS ENGINEERS & MANUFACTURERS,

IRONFOUNDERS AND CONTRACTORS,

GOWTS BRIDGE WORKS,

LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

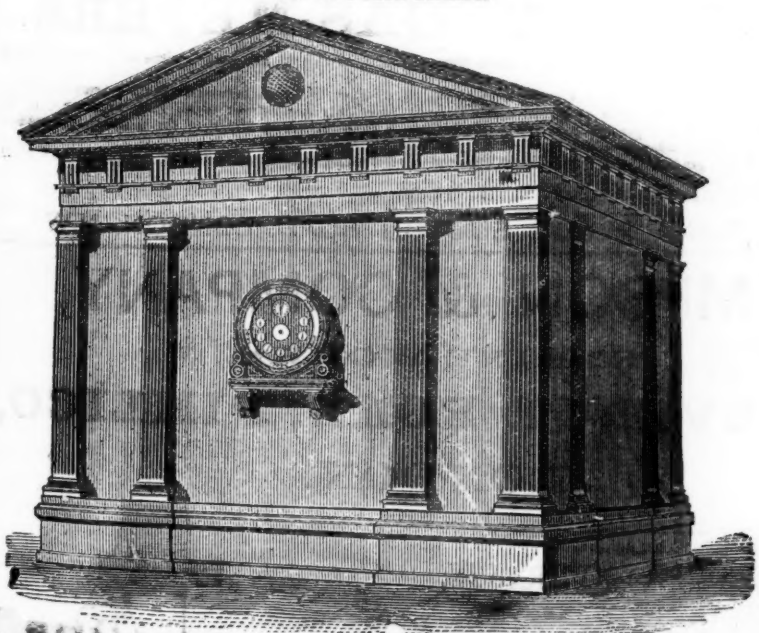
OF THE HIGHEST EXCELLENCE ONLY;

ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c. ON APPLICATION.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,

DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

FINSBURY CIRCUS, LONDON.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,

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DEMPSTER & SONS'

RENOWNED

WOOD SIEVES,

WITH TAPER BARS,

MADE BY MACHINERY

CAPABLE OF MAKING 10,000 FEET WEEKLY.

References to Hundreds of First-Class Engineers.

ROSE MOUNT IRON-WORKS,

ELLAND, NEAR HALIFAX.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,

ALBION WORKS, SALFORD,

LANCASHIRE.

THOMAS TURTON AND SONS,

SHEAF AND SPRING WORKS,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS,

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNERS

RATCHET BRACES, LIFTING-JACKS,

ANVILS, VICES,

AND ENGINEERS TOOLS GENERALLY

LONDON WAREHOUSE:

90, CANNON STREET, E.C.

R. W. WINFIELD AND CO.,

CAMBRIDGE STREET WORKS AND ROLLING MILLS,

BIRMINGHAM.

The following Medals have been awarded:—

GRAND COUNCIL MEDAL, LONDON, 1851. MEDAL, LONDON, 1862. GOLD MEDAL, PARIS, 1867,

The only Gold Medal awarded for "Apparatus and Processes for Heating and Lighting" by the Imperial Commissioners

MEDAL FOR PROGRESS, VIENNA, 1873.

The following Medals were also awarded at Paris, 1878:—

GOLD MEDAL for Chandeliers and Gas-Fittings.

GOLD MEDAL (Rappel) for Metallic Bedsteads and Furniture.

GOLD MEDAL (Rappel) for Art Metal Work. BRONZE MEDAL for Tube Metal and Wire.

MANUFACTURERS OF BRASS AND COPPER SHEETS,

TUBE AND WIRE,

ROLLED METALS, LOCOMOTIVE AND CONDENSER TUBES, CYLINDERS;

Ornamental, Taper, and Cased Tubes; Tin Tubes;

GAS-FITTINGS, CHANDELIERS,

BRACKETS FOR HEATING AND LIGHTING;

METALLIC BEDSTEADS.

Ecclesiastical and Mediæval Metal Workers.

GENERAL BRASSFOUNDERS.

REGISTERED TRADE MARK:

R. W. W. & CO.

LONDON OFFICES & SHOW-ROOMS: 141, FLEET STREET, E.C.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

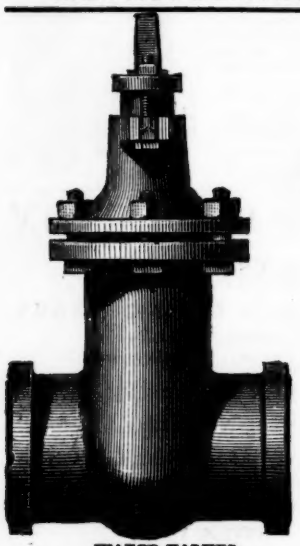
Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.



WATER-VALVES,
All Sizes, Flange and Socket, kept in Stock,
tested to 1000 feet head.

SIMPSON & COMPANY,

ENGINE-WORKS,

GROSVENOR ROAD, PIMLICO,

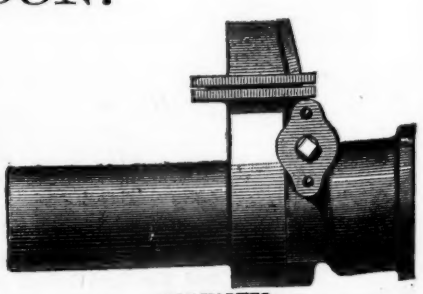
LONDON.

SCREW-COCKS, HYDRANTS,

SLUICES, PENSTOCKS,

And all other Machinery for

WORKS OF WATER SUPPLY, DRAINAGE AND IRRIGATION.



GAS-VALVES.
All Sizes, Flange and Socket, kept in Stock,
tested to 100 feet head.

TANGYE BROTHERS AND HOLMAN,

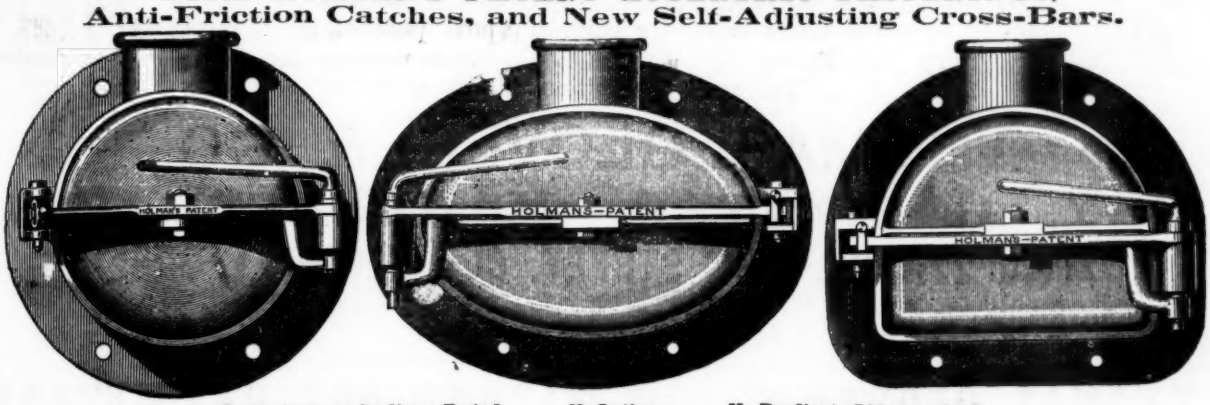
CORNWALL HOUSE, 35, VICTORIA ST., LONDON, E.C.

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1878.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

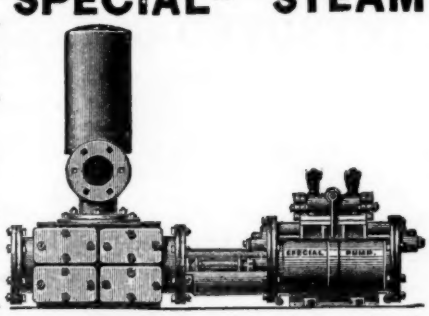
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



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Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851 New York. 1853. Paris, 1855. London. 1862.

Dublin, 1865.

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PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

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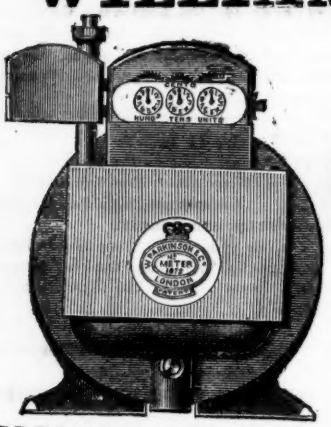

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MANUFACTURERS OF

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STATION-METERS & GOVERNORS,

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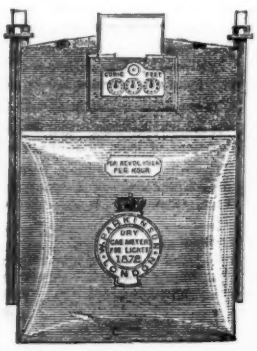

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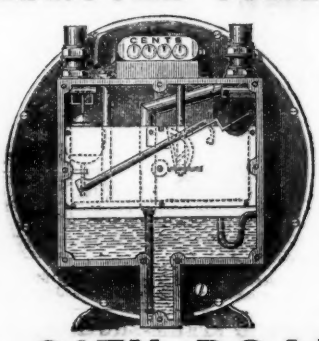
In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

Until arrangements, consequent upon the recent death of Mr. William B. King, are made, all communications for the Editor, remittances and orders for subscriptions and advertisements, &c., should be addressed to Walter King, 11, Bolt Court, Fleet Street, London, E.C.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 29, 1878.

Circular to Gas Companies.

We prognosticated last week that large experiments would be tried with the electric light in the Metropolis. The Commissioners of Sewers have recommended that a trial should be made on the Holborn Viaduct, in accordance with the suggestion of Lieut.-Col. Haywood, whose report is published in another column. There is a further recommendation that a lamp should be placed in front of the Mansion House, and another before the Royal Exchange. The system to be employed on the Viaduct will be the Jablochkoff; in front of the Mansion House another arrangement will be tried, but which of the several now contending for public support, has not been decided upon. We look on both these sites as eminently favourable for experimentation. The lighting of the space between the Royal Exchange and the commencement of Queen Victoria Street has been simply disgraceful. Twice the number of gas-lamps would have been employed by a Municipality anxious about the lives and limbs of their subjects. That people have not been daily maimed or killed in that locality has been chiefly owing to the main characteristic of Englishmen—viz., cautiousness. What the electric light will do for the timid wayfarers who seek to thread their way about the most ill-regulated thoroughfares of the Metropolis we shall now be able to see.

As regards the relative cost of gas and the electric light, we are still somewhat in the dark. Different observers, obtaining information from sundry foreign sources, vary considerably in their estimates; but we may take it that Lieut.-Col. Haywood is quite correct when he says that large areas and public spaces might be economically lighted by electricity, steam being the motive power employed. This point, however, will presently be settled by the experiments which will be made under Lieut.-Col. Haywood's superintendence. But little reliance can be placed on the estimates made in other countries, in consequence of the disparity in the cost of gas there and here. Still, a question of cost is but one element in the business. Supposing a superior light could be obtained, and that it could be adapted for the general purposes of illumination, that better light would certainly be chosen by a large number of people, even if it cost more money.

A specification of Mr. Edison's patent has been deposited in Chancery Lane, but the title is, we may say, disappointing. It is "A method of, and means for, developing electric currents, "and lighting by electricity." Strictly read, these words would mean simply the invention of a new machine for producing an electric current; but there may be much behind. It may be that the specification will include an account of the method by which Mr. Edison proposes to subdivide that current when procured. In the meantime, it would seem that he has been anticipated; for, in our last issue, there is the notice of an application for a patent by M. Arnaud, who claims to have invented a mode of indefinitely dividing electric currents. There is, further, the application from Mr. J. Clark, who has a new or improved method for adapting the electric light to domestic and other ordinary purposes. Mr. St. G. Lane Fox is also in the field with an invention for applying electricity to lighting and heating purposes. We are here reminded of the numerous inventions which have been patented, the object of which has been to supersede the use of coal gas. The fate of these is well known to our readers. Not one of them established itself, notwithstanding all the efforts made to foist them upon public notice. We do not pretend to prophesy the same result in the case of the application of electricity for lighting and heating purposes. As a matter of fact, we still know very little about the matter, and that little is not altogether favourable to the use of electricity. Time and continued experimentation alone can teach us what may be accomplished by the use of this agent. From the experiments recently shown by M. Arnand, it seems perfectly clear that an electric current can be subdivided, but to what extent is not made certain. It is annoying to be left in suspense, but it cannot be avoided. We shall have to wait six months before full details of these inventions come to hand; in the meantime we have the Jablochkoff, the Lontin, and the Rapieff systems to amuse the public. Little, we think, is likely to come of these, and, as we have said, we shall not attempt to predict what success will be achieved by those now announced.

But why, after all, should Gas Shareholders be scared into parting with their property at a ruinous sacrifice—that is, if they really do so, of which we have some doubts? There is plenty of room both for electricity and gas. It is perfectly certain that the one agent can never supersede the other. It might not be safe to say that the profits of Gas Companies may not be reduced, but we regard such a result as extremely problematical; in fact, we do not hesitate to express an opinion that, if Gas Directors will only be guided, under present circumstances, by sound commercial principles, the profits of their Companies will be rather increased than diminished. Competition is sometimes healthful, and a little of it may prove a useful stimulus to Gas Companies.

To what extent gas property has fallen in value under the influence of the present scare is not quite clear, but in the case of some Companies it seems to have reached as much as thirty per cent. When it is remembered that a very large amount of this property is held by those who cannot afford to lose money, the depreciation of value must be regarded as a real calamity. Unamiable people, we know, rejoice over the misfortunes of others, and we are sorry to say that many now boast that a day of retribution has come for Gas Companies. They cannot weigh the real import of their words, or such expressions would never be used. We have hinted above that the supercession of Gas Companies would be nothing less than a national calamity. If the Metropolitan Gas Companies lost their business, the failure of the Glasgow Bank would be nothing in comparison. We know some people always considered it a joke when widows and orphans were mentioned in connection with Gas Companies; but, as a matter of fact, the failure of these Companies would reduce hundreds of families to utter destitution. There is, however, little fear to be entertained. Enterprise and judgment will soon settle the question of Gas *versus* Electric Light, even if it should ever become a serious business.

To show to what extent the scare has extended, we may mention that little more than a rumour that Cork Harbour is to be illuminated by four electric lights has had a very serious effect on the value of the shares of the Alliance and Dublin Company, which are reported to have fallen within a short period from 17½ to 12⅜. Shrewd people will, we have little doubt, avail themselves of this opportunity of making a sound and profitable investment, and the shares, if thrown on the market, will most

likely find a ready sale. We are given to understand that such Metropolitan gas shares as are offered for sale are quickly bought up, and, oddly enough—if the information which reaches us is correct—by French speculators. If this be a fact—and the source of our information is very good—it is most significant. It shows that those who have been really intimately acquainted with the electric light, and have had the best opportunities of estimating its chances of success as a competitor with gas, are still confident that the latter illuminating agent will hold its own against its new rival.

No prospectuses of the three Electric Light Companies, the registration of which we announced last week, have, as yet, so far as we know, been issued. No names of Directors have, up to now, been announced; but as the first subscribers are usually selected, we may make a very good guess as to who will constitute the Boards. We have seen no quotations of the prices of shares, but we are told that the whole of the capital asked for by the Companies has been privately subscribed twice over. If this be true, there will certainly be some wild speculation before long. We may take it that the adventurous subscribers can afford to wait for dividends, or that they wish presently to throw their shares on the market at a high premium. From a report of the last meeting of the Metropolitan Board of Works, we learn that the Sun Company have offered their services to the Board, with the view of making experiments in Trafalgar Square or in Cockspur Street. What system this Company employ, we do not exactly know; but it seems they represent the Société Générale d'Electricité. If the enterprising Mr. Harrison be the Managing Director of this Company, he is not likely to let the grass grow under his feet, and we are not surprised that this Company have been the first in the field with the Metropolitan Board. We can look forward to all these experiments with perfect equanimity, if not with pleasure. London streets are confessedly dull, and street Arabs want amusement. They are promised some; but we fear that they will have to wait a long time for it, and then enjoy it but for a brief period.

We were, perhaps, wrong in expressing, last week, an opinion that the Limerick Gas Company (formerly the United General) were doomed to extinction. We stated, we believe with perfect accuracy, that the Limerick Corporation, at the present time, are unable to procure the money necessary to complete the purchase. By the Limerick Corporation Gas Act of last session, the Corporation are allowed up to Jan. 1, 1880, to complete the purchase. If they have not done so by that time, the power to purchase ceases, and any costs incurred by the failure will have to be paid by the Corporation. Looked at by this light, there may be the prospect of a happy future for the Gas Company, and we need hardly say that we hope for a continuation of private enterprise in the city.

We publish in another place the annual statement of the accounts of the Staffordshire Potteries Station of the British Gaslight Company, Limited, and we do not hesitate to add the expression of a wish that they were presented in a more modern and intelligible form. Why the Company do not adopt the form prescribed by the Board of Trade, we do not understand; but just now it seems to us highly desirable that the accounts of Gas Companies should be presented to the public in the most intelligible shape.

What is the best thing for Gas Companies to do in the present position of affairs—supply gas of a much higher illuminating power at increased charges, or furnish gas of the present quality at lower rates, and trust to derive much of their profits from the sale of residuals? Our readers will notice that our correspondent, who signs himself "More Light," is an advocate for the extensive use of high-class cannels. He combats our often expressed opinion, that the use of rich cannel, should be reduced to a minimum, as they are in progress of rapid exhaustion. He thinks that the present generation should use up the mineral as fast as they possibly can, and leave future generations to look after themselves. An illustration he uses is not a particular happy one. Caithness and Guernsey granite paving-stones are being rapidly replaced, at all events in our Metropolitan thoroughfares, by wooden blocks—vegetable products capable of indefinite production for our use and that of our successors. We fully appreciate the motives of our correspondent; but we cannot retreat from the position we have taken up. What is wanted in London, at the present conjuncture, is simply cheaper gas; if it can have a higher illuminating power, so much the better, but to compete successfully with the electric light we simply want gas at less price. No one has yet speculated upon the effect the electric light may have upon the price of gas coals and cannel. We shall be glad to have our correspondent's views upon this matter.

A friend gives in a communicated article, which we publish in another column, some ideas on the heating and ventilating of apartments by means of gas, which, we think, deserve attention. So far as we know, these ideas are perfectly original, but the utility of the plan described has to be demonstrated. The two great objects to be kept in view, at all events so far as sitting-rooms are concerned, are to obtain a cheerful appearance with sufficient warmth. A sun burner would, of course, give plenty of light, and the latter can be secured by the use of asbestos or pumice-stone fires. For bed-rooms, we are inclined to think that the plan suggested by our correspondent would answer very well. There would be light, warmth, and, last but not least, pure air. We hope soon to hear that experiments have been made with our friend's system.

We notice in a contemporary that a change of Examiners has been made at one of the gas-testing stations of the Metropolitan Board of Works, in consequence of the resignation of Mr. H. L. Greville. We cannot, for a moment, suppose that this resignation was made voluntarily. The facts are that Mr. Greville, besides being Gas Examiner at Graham's Road, had been for many years Assistant to Mr. Keates, the Chemist and Chief Gas Examiner to the Board. With a laudable anxiety to improve his position in life, Mr. Greville accepted the position of Chemist to the Commercial Gas Company, naturally thinking that, as the gas he was testing for the Board was perfectly independent of the supply by the Company of which he had become an Officer, he would be able to continue in his post as Examiner; but this, it seems, has not been allowed, and Mr. Greville has been compelled to resign. The affair reflects the greatest discredit on all concerned in the virtual dismissal. It involves considerable pecuniary loss to a young man, and an imputation on his honour. We cannot help thinking that if the case had been fairly put before the members of the Board, the decision would have been reconsidered, and Mr. Greville allowed to retain his position.

Water and Sanitary Notes.

THE Vestries are beginning to discuss the renewed project of the Metropolitan Board of Works for acquiring the undertakings of the Metropolitan Water Companies, and providing an additional supply. So far, it cannot be said to have been received with favour. The Vestries are naturally alarmed at the expense which repeated abortive attempts to obtain parliamentary sanction for the Board's designs entail upon the ratepayers. They have tried to ascertain what the expenses incurred in connection with the proceedings of last session amounted to; but the information is still held back — why, not even Mr. Roche himself can lucidly explain. It *must* be given some day, we are told, and, if that be the case, why should it not be given at once? The fact, we may take it, is that the amount is so large that the announcement of it would raise a storm of opposition in the Metropolis, which would effectually stop the Board's proceedings in the matter. It is stated that the enormous outlay already expended has been illegally incurred, and it is suggested that it should be objected to before the Auditor. This may be another reason why the Board keep back the information which men like Mr. Watkins and Mr. Fowler endeavour to obtain.

We think that the Sheffield Water Company are slowly emerging from their difficulties. They have accumulated an amount of profits which allows of the division of two per cent. for the years 1876-77, and the Directors accordingly called an extraordinary meeting of the Shareholders to sanction the payment of dividends; but they, wisely, we think, decided to recommend the payment of one per cent. only for the years mentioned, leaving a balance of £15,649 to be carried forward for the purpose of equalizing dividends in future years. The prospects of the Company justify the anticipation that in the course of a very few years they will be placed in a most satisfactory position. Sheffield will grow if England do not decay, and as the works constructed with the capital which is now, unfortunately, unproductive are calculated to be sufficient to supply the wants of a population growing at a natural rate for a couple of generations, the Company must, in the long run, be eminently prosperous. Much judicious management will be required to preserve the works in good order, and arrange the finances of the Company.

The unfortunate Odessa Water Company are still in difficulties, from which it would appear impossible to extricate them, unless a more cordial political understanding can be brought about between England and Russia. The complete history of the Company may not be known to every one; but there can be no doubt that they have been shamefully done—we shall not say swindled—by the Municipality of Odessa. With English capital, magnificent works have been constructed for the supply of the

purest water to the city; but by the action of the Municipality, the Company are debarred from making any profit, the object apparently being to compel the sale of the undertaking at a ruinous sacrifice. English capitalists will not be encouraged by the experience of the Odessa Water Company. Their money has made most of the public works in Russia, and those under State superintendence have always been honourably conducted. This has not been the case with a few undertakings executed under concessions from Municipalities, and these will have to go elsewhere to find funds for public works.

The Woolwich Local Board of Health have had samples analyzed, of the water of the Thames taken between Billingsgate and the point where the unfortunate *Princess Alice* went down. Few persons, we imagine, will be surprised to learn that this stretch of the river is contaminated with sewage. As the sample of the water at the scene of the disaster was taken at a time when the sewage outfalls were open, it is not to be wondered at that a very large amount of sewage matter was found. It could not be otherwise, seeing the enormous amount of sewage poured in when the tide is ebbing. On the question as to whether or not the unfortunate victims of the disaster were poisoned rather than drowned by the water, Mr. Wigner, the Analyst, expresses himself with some caution, and states opinions which we cannot endorse. He thinks that vomiting may have been induced by the nauseous state of the water, and that this may have led to the filling of the lungs with water, which made the bodies specifically heavier, and carried them down at a more rapid rate. It was an old-world notion that the lungs of drowned people did fill with water, and our ancestors used to roll the bodies of victims over barrels, in order to get it out. At the present time the treatment of people apparently drowned proceeds on the assumption that the lungs of people who have been immersed in water are still free to receive air. There is such a thing as an epiglottis. The state of the Thames in the locality is undoubtedly very bad, and Mr. Wigner's report may be of some assistance to those who wish to get it remedied. There can be no question about the enormous deposit of sewage mud, and something must soon be done to clear the channel of the river.

The time allowed by the Government to the Corporation of Glasgow to free the Clyde from sewage is fast ebbing away, and no scheme has yet been decided upon. An extension of time was promised, if the Corporation would only determine to do something, and say what that something was to be. The Corporation have now under consideration, as we have said before, a scheme devised by Mr. Bateman for taking the sewage of the district down to Dalmuir, there precipitating it with some chemicals, allowing the clear effluent to flow into the Clyde, and barging the sludge round to Loch Long. But before a decision can be come to on the matter, the Corporation have to consult some neighbouring Local Authorities who are interested. In the meantime, we notice that some opposition to Mr. Bateman's plan is springing up in Glasgow, but it does not appear to be of a very formidable character. It may, however, grow in proportions, and prevent the Corporation coming to such an immediate decision as, under the circumstances, is desirable. To the scheme itself, no objection, we think, can be raised; but it must be clearly understood that it is not calculated to cure all the evils of which the people along the banks of the Clyde complain. The cost of the works it is estimated will amount to upwards of a million, and the annual charges some people expect will reach £90,000. At the present moment the Glasgow people are rather staggered by these figures; but the failure of the City Bank will soon be forgotten by all but the sufferers, and Glasgow will go on as prosperously as ever, quite prepared to meet the debt which it is now proposed to lay upon the city.

The Corporation of Wigan have resolved on instituting a sewage farm. They have leased land at Newburgh, to which the sewage will be conveyed by gravitation, there being a fall of from four to five feet per mile. We are happy to see that the Corporation do not expect to make any profit by the farm. The estimated annual loss upon it will amount to £4000 or £4500. The cost of laying out the farm and of permanent works, &c., it is calculated will amount to the grand total of £62,544. If Wigan gets quit of its sewage, without producing a nuisance, at this charge, the outlay cannot be considered extravagant.

Notwithstanding the magnificent display of vegetables at the Exposition Internationale, from the sewage farm at Genevilliers kept by the Municipality of Paris, it seems that the farm is practically a failure, and that the Paris public do not appreciate the vegetables produced upon it. The farm is becoming to be considered a nuisance in the neighbourhood, and it has been decided to brick over all the channels which convey the sewage from the outfalls at Clichy to the works.

Communicated Article.

THE ADVANTAGES OF GAS FOR HEATING AND VENTILATING PURPOSES IN HOUSEHOLD ARRANGEMENTS.

By Mr. A. F. Wilson.

The exigencies of our climate necessitating, during nearly three parts of the year, a careful attention to the warmth of our dwellings, many people, forgetful of other sanitary laws, imagine that to obtain this healthful comfort, living-rooms should be small and, as far as possible, hermetically closed—a cheerful appearance and a small portion of heat being supplied from the ordinary fire-place, which also performs, although not by any means in a satisfactory manner, the functions of ventilation.

The fallacy and wasteful extravagance of this system is, however, becoming to some extent understood. A complaint is often heard in severe weather that, however large the fire may be which is maintained in the grate, and however closely, by patent packing, the doors and windows may be shut, the temperature by Fahrenheit's scale will not be coaxed to exceed 50°, if it should reach that limit; draughts are felt everywhere, and elderly people who are unable to take outdoor exercise are half frozen in their otherwise luxuriously furnished apartments.

As a heating agent, gas is not by any means, however, even at the present time, unknown. "Cooking by gas" has been explained and expounded by well-known and practical men, whose published treatises may be obtained, by those who desire information, on application generally to the gas company who supply their district. Baths in middle-class houses are, in many cases, heated by gas, and in connection with the conservatory hot-water arrangement; and in the form of a stove, or in our common fire-places, with the aid of asbestos, it has been found economically to supply a want, and is consequently largely utilized.

A more important want of the community would, however, be satisfied, and, in the interest of gas companies, a greatly increased consumption would accrue, if a practical and efficient system of heating could be carried out, which would partially or entirely substitute parlour and bed-room fires.

Apart from the sentimental feeling of cheerfulness, as personified by a clear fire on the hearth, and to which, no doubt, something must be conceded, our present system of keeping ourselves warm and comfortable very much resembles the old story of the market gardener, who upon his ass's back used to balance a pannier full of vegetables on one side, with a pannier full of stones upon the other, doing, as he said, as his father had done, and completely ignoring the possibility of either halving the labour, by omitting the stones and dividing the vegetables, or doubling the result, by putting vegetables on both sides. We sit in our rooms and thoroughly cool ourselves with the cold air, which, drawn by a strong upward current in the chimney, is rushing to support combustion in the fire-place, and we afterwards warm ourselves with the small portion of heat which the fire-place condescends to throw out upon us, the other and greater portion of the heat of our fires being allowed to pass up a non-radiating conduit in a brick wall, and consequently escaping, at a scarcely lessened temperature, to where such temperature can be of no conceivable utility.

Similarly, ventilation goes on in that happy-go-lucky way which may tersely be described as "somehow." Air being invisible, we do not get disgusted at what goes into our lungs, as doubtless would very soon be the case if we were asked to introduce equally nasty and unwholesome matter, in a tangible and visible form, to our stomachs. The fire-place draws to itself a current of air in a stratum not much higher than the upper part of the opening of the grate, but there is generally an almost stagnant stratum above this opening, towards the ceiling, containing a portion of carbonic acid, which, having risen in a heated state from the gas-burners, from its higher specific gravity, gradually sinks as it cools. When the rooms are, as described, almost hermetically closed, the under-draughts are still felt; but this upper stratum becomes abnormally heated, and consequently an attenuated atmosphere is inhaled, mixed with the suffocating diluent—carbonic acid.

The mode of heating and ventilating by gas which I consider most promising is by sun or ceiling burners in the basement, entrance-hall, and upon the landings above, except the uppermost.

These burners would each be divided, so as to serve partly for heating and partly for lighting purposes, arranged with controlling taps, and placed one above the other. The upper burner, or series of burners, of sufficient dimensions for the heat required, would be set immediately under the shafthood, close to the ceiling, and would be supplied with air on the Bunsen, or as it is commonly called, the atmospheric principle. It would be kept alight during the day, and for such time in the evening as should be found necessary. The lower burner would not be atmospheric, but would be used solely for lighting the hall or landings; it could be placed some little distance under the upper one, and might have a globe, as is customary with other hall lights.

The heated products of combustion I would convey by the usual sun-burner shaft of sheet iron, laid in an outer casing a little larger than itself, and with proper precautions against fire, conveyed in the most convenient manner through the rooms upon the landing immediately above the burner, connecting finally to a shaft in the wall leading to the chimneys, at points above the openings of the fire-places.

The outer casing so described would be open to the outside air at the lower end. The air within would be heated by radiation from the sheet iron, and so heated would be allowed to escape into the rooms at

small apertures near the doors and windows, so as to catch and heat the air-current of the room, entering from without, in its passage to the fire-place.

Such is a brief sketch of the leading idea I entertain on this question. Gas is not now in its infancy, and a novel idea need not be startling. If it is not novel, I certainly have never known or heard of gas being thus applied. The principle of hot-air tubes is, of course, common; but a stove upon the level of the floor, to which such hot-air tubes would be connected, would be inoperative as a ventilator, whereas a burner-furnace such as I have described would ventilate the upper part of our rooms, either by a direct aperture over the door into the hall or landing, or by a tube from the room joined to the burner-shaft.

Partly to give a cheerful appearance to the room, but principally to maintain a current in the chimney, to carry off the products of combustion of the burners, I would keep up, although on a reduced scale, the present grate fire, but I fancy the progressive ideas of the day, urged on by the "domestic labour difficulty," would again come in here to favour the use of gas, if a really efficient gas-fire could be produced.

With gas at its present cheap price, a properly-arranged system of heating in this way should compare favourably with the usual crude and unsatisfactory method, and experiments to determine the comparative cost might with advantage be undertaken by both architects and gas companies, who are the parties professionally and pecuniarily interested. To the credit of the proposed arrangement would, however, have to be put a not insignificant figure, as representative of the saving in household work thus effected. I heard lately of a case where in a moderate-sized family the services of one domestic were dispensed with by using parlour and bed-room asbestos gas-fires instead of coal.

Independently, however, of cost, comfort and health would be improved, and the use of gas as a heating and ventilating, as well as a lighting, agent would be more fully developed.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE ELECTRIC LIGHT.

Sir,—In your issue of the 22nd inst., you somewhat confuse my argument by a mistake in printing.

I am made to say that "The cost (of fuel to produce the electric light) is thus equal to 10s. 8d. for light equal to that produced from 1000 feet of gas." What I did say was that this cost (by the calculation of 1d. per horse power of engine) is equal to 10·8d.

My argument previously showed that such price for fuel was to be compared, as a manufacturing charge, with the net cost of coal to the London Gas Companies—viz., 6d. to 7d. per 1000 cubic feet, and that supposing all practical difficulties in the introduction of electric light to be overcome, still that, as the Company to be formed for such purpose would, equally with the Gas Companies, have to calculate upon the payment of dividends upon capital and upon management and general expenditure, the relative advantages of cost so far were in favour of the Gas Companies, instead of being against them, as has in the daily press been persistently asserted.

34, *St. George's Road, S.E., Oct.* 23, 1878. A. F. Wilson.

MORE LIGHT FROM COAL GAS.

Sir,—Your correspondent, "G. T. A.," in last week's issue, has thrown down to gas companies a very sound business-like suggestion—viz., "to ascertain the best means of increasing the illuminating power of coal gas."

Now, when there is looming before them the probability of their entire trade being lighted out, it will not do to be busying themselves as to mere mechanical arrangements of how to construct a burner which will attract more or less oxygen during combustion. That "herring across the scent" is run down. It may have saved the real game for a season, but now, when the hunters have discovered their error, they are again on the true scent, and it will be well if the huntsmen take the lead in guiding them in their chase for light, and leave the by-play after burners to mere mechanical manipulators. In fact, the gas consumers never did endorse the burner glamour, although ever so much ink has been wasted on it; the light they bought, and as they used it, was not a farthing candle's value improved, and it would be well for directors and engineers to earnestly turn their attention as to how in reality they can give more light from their article of commerce, irrespective of the mechanical means of using it.

It is known to most people—at all events, it is known to the travelling public—that London is badly lighted at night. Its gas, said to be equal to 16 or 17-candle power, is not so good, *as light*, as it was 30 years ago. Now, why is this? It is true the street-lamps may, in some localities, be advantageously doubled, and so increase the light by doubling the consumption of gas; but it must be apparent that an increase to this extent in dwelling-houses, offices, and work-rooms would be very detrimental to health, besides being injurious in many other respects. It ought, if possible, to be avoided, and I respectfully submit, along with your correspondent, it can be avoided; and if shareholders in gas companies are alive to their interests, they will be wise in seeing that it is avoided.

There are thousands of acres of cannel and shale in the British Isles, and in other parts of the world, which, if a small per centage of it was mixed with the common caking coal now in use, would produce gas of much higher illuminating power, and would, I believe, give more general satisfaction, especially for indoor lighting, than electricity, because of being both safer and more easily regulated.

I was much impressed with a remark made recently by a gentleman who deservedly stands at the head of the gas profession. When asked by a shareholder, at the general meeting of his Company, for his opinion on the electric light, he replied, that it would be a very great improvement on the lighting of such places as in front of the Mansion House, &c., in London; the result of which would be, that the public would never be satisfied with such a modicum of light as there is now in the small streets, and they would want a great deal more gas.

It does not appear to have been present to that gentleman's mind, that what the public want is *light*, and that, doubtless, they would prefer that, instead of increasing the volume of gas required for the purpose. They might be disposed to ask if the light could not be improved from the same volume. I am inclined to believe this would be the desire of the members of the Lighting Committee of the Corporation of the City of London.

I am aware that your columns have, as a rule, advanced—what shall I call it?—the *scare* that cannel will soon be exhausted; consequently, we, the present mortals, must use it sparsely, for the benefit of our succeeding mortals. Now, I hold, on that rule, that we ought to give up bringing our best paving-stones from Guernsey and Caithness, as these useful necessaries, not being of the vegetable or animal kingdom, by-and-by there will be none left; but, seeing we do not apply that rule to any other article of commerce, so far as I know, I fail to see any logical reason why we should apply it to our supply of light. Let me ask, would we do so presuming our artificial lighting for the whole of the three kingdoms was supplied by the Board of Trade? I wot not. The Thames, the Liffey, and the Clyde would put in a claim for *fairations* in the disposing of the best light going. This being the case, it occurs to me that it would not only give satisfaction to the consumers of artificial light, but would result beneficially to gas companies interests, if gas engineers in London would ascertain, by experiments, the best means of increasing the illuminating power of light made from coal. Now, when they practically enjoy a monopoly for the supply of artificial light in their respective districts of the British Metropolis, and, seeing that the crave of the public is for improved light, they ought to meet it, if practicable, irrespective of the value of the residuals in its manufacture. It is this mixing up the sale of coke with the supply of light which has, in my opinion, made London about the worst-lighted capital in Europe, and whether the improvement is to come from electricity or coal gas, depends very much on the Directors and Engineers of the present London Gas Companies; but come it will.

Oct. 25, 1878. More Light.

THE COST OF COAL AND THE PRICE OF GAS.

Sir,—The remarks of Mr. G. D. Malam, which appeared in your last publication, would have elicited no reply from me had it not happened that he has touched upon a matter which, although quite foreign to the discussion into which he presumed to enter, has considerable interest for me, and doubtless for many other of your readers—I allude to the qestion of leakage.

Mr. Malam has given us some data relating to Bingley; but, unfortunately, Bingley is rather too small for comparison. I therefore wish to inform him that I purpose making application to Halifax for information under the following heads:—

Make and Sale of Gas.
Length of Mains.
Number of Meters.

With your permission, Mr. Editor, I will give the figures, with corresponding statistics for Leeds, in your next issue.

Leeds, Oct. 26, 1878. H. Woodall.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Oct. 23.

(Before Justice Lush, *Vacation Judge.)*

WILDE *v.* WELLS AND CO.

In this case, an interim order was obtained last week on behalf of Mr. Henry Wilde, restraining the defendants, Messrs. Wells and Co., of Shoreditch, from infringing the plaintiff's patents (granted in 1863, 1865, and 1867) for generating the electric light. The plaintiff, from reading a circular of the defendants, learned that they were about to introduce into England the system of electric lighting now used by the Société Générale d'Electricité, in Paris, and known as the Jablochkoff system, and that the Gramme mode of generating the light was to be used in combination therewith, and it was after obtaining this information that the plaintiff commenced proceedings.

Mr. Aston, Q.C. (with him Mr. Romer), on the motion to continue the injunction until the hearing came on, stated that in the defendants affidavits, which his client had not had time to answer, an attack had been made upon the validity of his patents. This being so, he could not do more than ask for a continuance of the interim injunction for a week, to give time for the plaintiff to meet the case set up.

Mr. Webster (with whom were Mr. Terrell and Mr. Healey) submitted that the plaintiff was not entitled to any injunction whatever. The defendants had a complete answer to the plaintiff's contention. They would, however, consent to keep an account.

The result was that no order was made on the motion, except that costs be costs in the action (this to be without prejudice to the plaintiff's rights, if any), the defendants undertaking to keep an account.

The interim injunction therefore dropped.

The late Mr. William B. King.—At a meeting of the West of Scotland Association of Gas Managers, held in his Lordship's Larder, St. Enoch's Square, Glasgow, on Tuesday, the 22nd inst., it was moved by the President (Mr. S. Stewart, of Greenock), and seconded by Mr. M'Gilchrist, of Dumbarton, "That an extract from the minutes of this meeting be sent to Mr. King, expressing their great regret to learn the death of his father, Mr. W. B. King, Editor and Publisher of the Journal of Gas Lighting, and their sincere sympathy with his family for the great loss they had sustained—a loss that was felt by the whole body of Gas Managers." At the meeting of the Midland Association of Gas Managers, held in Birmingham last Thursday, a resolution was unanimously passed "expressive of profound regret at the death of one to whom gas lighting owes so much as to the late Mr. W. B. King, whose loss is felt by many as that of a personal friend; and tendering to his family heartfelt sympathy with them in their bereavement."

Miscellaneous News.

METROPOLIS GAS SUPPLY.

Metropolitan Board of Works.

At the meeting of the Board last Friday—Mr. E. D. Rogers in the chair—the Works and General Purposes Committee presented the following report:—

Your Committee have to report that, in pursuance of the resolution of the Board of the 22nd of March last (No. 29), they have considered the letter of the Board of Trade, stating that they are not prepared to deal with the subject of the proposed amendment of the clauses, imposing forfeitures for deficient illuminating power, in the Acts of The Gaslight and Coke Company, the Commercial Gas Company, and the South Metropolitan Gas Company, during the current session of Parliament, but that if this Board are still desirous that the amendment should be made, and should therefore issue notices for next session, the Board of Trade will be ready to again consider the matter.

This question has arisen in consequence of the amount of the penalties imposed by the existing clauses for deficient illuminating power being made to depend upon the amount of gas made, during the day upon which the deficiency occurs, at the station sending out the defective gas.

As, in consequence of the amalgamations of several of the Companies undertakings, connections have been made between the mains, which may render it impossible to prove from what particular station defective gas may be sent out, it was considered desirable to substitute a penalty for any gas of deficient power supplied by a company, irrespective of the quantity supplied, or the station sending it out. This was agreed to on all hands, but the Board were of opinion that the penalty should be a fixed one of £25 for each offence, while the Companies considered that the Magistrates should have the power of reducing it, and, therefore, desired the insertion of the words "not exceeding" before the amount; and, in consequence of this disagreement, the matter could not be dealt with in the past session of Parliament.

Your Committee have now had under consideration the steps which will be necessary for amending the clause in the next session of Parliament; but as it appears that no case has yet arisen to which the existing law has not been adequate, they consider it undesirable to recommend the issue of the requisite parliamentary notices, and therefore recommend that no further action be taken in the matter at present.

On the motion of Mr. Cook the recommendation was agreed to.

Dr. Whitmore's reports on the illuminating power, pressure, and quality of the coal gas consumed in the parish of Marylebone, during August and September, and supplied by The Gaslight and Coke Company.

August.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quanty. of Sulphur in 100 Cu. Ft.	Mean Quanty. of Ammon. in 100 Cu. Ft.	Sulphuretted Hydrogn.
	*Mean of 10 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Gas supplied from the Fulham works . .	16·85	17·30	16·31	23·42	9·42	14·50	0·75	No trace
Gas supplied from the Beckton and Bow works	16·84	17·31	16·50	38·87	17·12	10·95	0·60	No trace
Cannel gas supplied from the Pimlico works	21·13	21·40	20·81	29·47	14·70	14·20	1·05	No trace

Mean of daily readings of barometer . . . 29·81
" " " thermometer . . . 74·00

September.	*Mean of 23 Obser.							
Gas supplied from the Fulham works . .	17·05	17·31	16·70	20·78	10·60	14·56	0·40	No trace
Gas supplied from the Beckton and Bow works	17·09	17·50	16·71	36·61	16·95	10·66	0·43	No trace
Cannel gas supplied from the Pimlico works	21·15	22·10	20·70	30·88	14·31	12·10	0·80	No trace

Mean of daily readings of barometer . . . 29·72
" " " thermometer . . . 68·53

* Each observation consists of ten readings of the photometer, at intervals of one minute.

During the months of August and September, the mean illuminating power of the gas supplied to the parish from the Fulham works was equal to the light of 17 candles; it ranged between 17·31 and 16·31 candles, showing that on no occasion was it less than one-third of a candle in excess of the legal standard. The mean amount of sulphur contained in 100 cubic feet of gas during the same period was 14½ grains, and of ammonia rather over half a grain. The mean illuminating power of the gas supplied from Beckton and Bow was equal to very nearly 17 candles, and ranged between 17·50 and 16·50 candles. The mean amount of sulphur was 10·8 grains, and of ammonia half a grain. The mean light of the cannel gas was equal to rather more than 21 candles; it ranged between 22·10 and 20·70 candles. The mean quantity of sulphur found was 13 grains, and of ammonia something less than one grain. The pressure of all the gases was satisfactory, and on no occasion was sulphuretted hydrogen detected in either of them by the ordinary tests.

METROPOLIS WATER SUPPLY.

The Metropolitan Board's Costs in Connection with the Water Bills of Last Session.

The following is a copy of a circular letter addressed to the Delegates of the Metropolitan Vestries, on the subject of the costs incurred by the Metropolitan Board in respect of the two unsuccessful Water Bills they promoted in the last session of Parliament:—

110, *Gloucester Road, Regent's Park, Oct.* 21, 1878.

Dear Sir,—No doubt you will remember the opposition we felt it our duty to give to the Water Bills introduced by the Metropolitan Board of Works last session, and the fate they met with. In the face of that and the very considerable amount expended in promoting them, variously estimated at from £10,000 to £50,000, they have again referred the question to a Committee as before, particulars of which I give below:—

Metropolitan Board Meeting, held Oct. 4 last.—By Mr. Selway,

That he will move—"That it be referred to the Works and General Purposes Committee to consider and report upon the advisability of preparing a Bill to be laid before Parliament providing for the acquisition by this Board of the interests of the several Companies now supplying the Metropolis with water, also upon what steps it will be desirable should be taken to ensure an improved supply of water to the Metropolis."

This motion, on a division, was carried by 21 to 6.

On such decision being arrived at, I gave the following notice, in order that the members should know what the previous attempt cost the Board, before launching again in a further useless expenditure:—

By Mr. Watkins,

That he will move—"That a return (in detail) be presented to the Board of the cost incurred in preparing evidence, professional charges, experiments, and all other charges and expenses caused in connection with the Bills laid before the House of Commons last session, having for their object the purchase of the existing Water Companies and a new supply of water to the Metropolis."

This I moved at a meeting of the Board on the 11th of October, and which was seconded by Mr. Carr (Marylebone). It was met by the "previous question" as an amendment, moved by Mr. Tolhurst, seconded by Mr. Munro. On a division the amendment was carried, and the motion therefore refused by 15 for and 11 against.

The division list is as follows:—

For the Previous Question and against the Motion—15.	*Against the Amendment and in favour of the Motion*—11.
Cook, Poplar.	Brewer, St. George's, Hanover Square.
Cox, Chelsea.	Carr, St. Marylebone.
Dalton, St. Martin's-in-the-Fields.	Elt, Islington.
Fell, Shoreditch.	Fowler, Lambeth.
Freeman, Kensington.	Harris, St. Saviour's, Southwark.
Furniss, St. Pancras.	Jones, Mile End Old Town.
Le Breton, Hampstead.	Legg, Bermondsey.
Munro, Whitechapel.	Leslie, St. George's, Hanover Square.
Nathan, Limehouse.	Phillips, Strand.
Richardson, Greenwich.	Thompson, Clerkenwell.
Roche, Paddington.	Watkins, St. Pancras.
Runtz, Hackney.	
Selway, Newington.	
White, Westminster.	
Tolhurst, St. Olave's.	

It will be seen by this that they are ashamed of the enormous expenditure incurred, and which most of those in this majority are responsible for; and they are afraid the Metropolis should know how they expend the monies of the ratepayers; the mover of the amendment in his remarks saying, if the return was granted, it would only be "another weapon" in the hands of their opponents.

The Metropolitan Board is now becoming a gigantic taxing body, the restless and ambitious spirit of some of its members leading it into all manner of extravagant schemes and reckless expenditure, and which, sooner or later, must be condemned; and when it is also known that a majority can be found to refuse a return, legitimately asked for, of the manner they expend the funds committed to their care.

As you were one of the delegates who took a part in the opposition with St. Pancras on the last occasion, I have felt it my duty to send you this information; and I have also determined to retire from a body where there are found a majority of its members afraid to face the public with a return of one of their items of expenditure.

Yours very faithfully,

St. Pancras. James Watkins.

St. Pancras Vestry.

At the meeting of this Vestry last Wednesday—Mr. Kent in the chair—a letter was read from Mr. J. Watkins, one of the members of the Metropolitan Board of Works, announcing his intention to resign, on the ground that he had not only been publicly insulted in the Board by his colleague, Mr. R. Furness, but that he could no longer act with a body whose "reckless expenditure must, sooner or later, be condemned." He declared the Metropolitan Board to be a "gigantic body, who, after having expended from £20,000 to £50,000 on the late Water Bills, were ashamed of such expenditure, and therefore refused to grant a return for the information of the ratepayers," for which he had moved.

On the motion of Mr. Robinson, it was resolved that Mr. Watkins be requested to reconsider his determination to resign.

Mr. Gibbs (Vestry Clerk) said if Mr. Watkins had sent in his resignation to the Metropolitan Board of Works, the motion was too late.

Metropolitan Board of Works.

At the Meeting of the Board last Friday—Mr. E. D. Rogers in the chair,

Mr. Roche asked if the Chairman had received any communication from Mr. Watkins, one of the representatives of St. Pancras, resigning his position as a member of the Board, because, by Act of Parliament, it was necessary that any member desiring to resign should signify the same in writing to the Chairman of the Board. He also called attention to a circular which had been issued by Mr. Watkins [see above], in which he said that the motion, asking for certain returns in regard to the Water Bills of last session, was rejected by 15 votes to 11, and that the Metropolitan Board was a "gigantic body, who, after having expended an immense sum on the late Water Bills, were ashamed of such expenditure, and, therefore, refused to grant a return for the information of the ratepayers." He denied that the Board were ashamed of the expenditure that was incurred in regard to these Bills, and he thought it right to say that this statement was contrary to the fact. The Board were not ashamed of the expenditure, and at the proper time would be prepared to justify it. If there were any people who should be ashamed of it, it was those who rendered the expenditure altogether nugatory by persistent opposition. The Board had not refused a return of the mode in which the funds of the ratepayers had been expended. What was recently said was, that this was not the proper time for it to be furnished. The Board furnished most complete statemenis in regard to their whole expenditure, and in due course every information as to the outlay in respect of this particular matter would be afforded.

The Chairman said he had not received any communication from Mr. Watkins.

Mr. Furniss denied that he had ever shown any incivility to Mr. Watkins, as that gentleman alleged in his circular. He had differed in opinion with him, but he had a right to exercise independent judgment.

Mr. Carr said he thought there was not so much untruth in Mr. Watkins's statements as Mr. Roche would have the Board imagine.

Mr. Fowler said he was exceedingly glad to hear that information as to the expenditure on the Water Bills would be furnished, and he hoped that the Board would, as speedily as possible, take such steps as would remove the impression that there was a desire to withhold it.

Hackney District Board of Works.

At the meeting of the Board, on Friday last,

Mr. C. Green asked, with respect to the proposed purchase of the Water Companies, whether Mr. Runtz was prepared to furnish the Board with any information respecting the amount of costs incurred by the Metropolitan Board of Works in connection with the Bills promoted by them during the last session of Parliament, with a view to obtaining powers to acquire the properties of the several Water Companies of the Metropolis,

and to make improved arrangements for the future supply of water to the inhabitants.

Mr. RUNTZ said that he, and he believed the Board generally, were desirous that the information should be supplied at the earliest possible moment; but the fact was that, up to the present time, the Metropolitan Board were not in a position to supply it, owing to the delay that had taken place on the part of the analysts, and other scientific men who had been engaged, in sending in their accounts.

LAMBETH VESTRY.

At the usual meeting of this Vestry on Thursday last,

Mr. TURNER called attention to the fact that the Metropolitan Board of Works had refused to pass a motion proposed by Mr. Watkins, one of the members, to give an account of the cost attending the introduction of their two Bills, affecting the Water Supply of the Metropolis, in the last session of Parliament. The expenses incurred were variously estimated at from £10,000 to £50,000, and he considered it a very strange proceeding that the Board should refuse to allow the public to know what the exact amount was before again proceeding with the measures. He thought the public, who paid the money, had a right to the information, and he moved that the Clerk should write to the Metropolitan Board, requesting that it should be furnished.

Mr. HILL seconded the motion.

Mr. FOWLER expressed his regret that the Board should have again passed a resolution to proceed with the Purchase Bill, but at the instance of Mr. Roche a very valuable addition was made to the proposal, and that was, that before it was pushed forward the Government should be asked to state whether they would give it their support. He had no doubt whatever what the answer would be. The way in which the Board had dealt with the question of inundations had so undermined Mr. Cross's confidence in the Board that the answer would be unfavourable. He had hoped that the Board would have dealt with the question in a different manner, and would have taken measures to introduce a Regulations Bill, which would have enabled them to satisfy the ratepayers, by seeing that the water supplied was pure in quality, sufficient in quantity, and supplied at equitable charges. If they had taken that course he believed they would have given general satisfaction.

The motion was put and agreed to.

Dr. Whitmore's reports on the composition of Thames Companies and other waters consumed in Marylebone during August and September:—

AUGUST.	In Grains, per Gallon.			In Parts, per Million.		In Degrees.	
	Total Solid Matter.	Loss by Incineration.*	Chlorine.	Free Ammonia.	Albuminoid Ammonia.	Hardness.	Hardness after boiling Fifteen Minutes.
West Middlesex	19·00	0·80	1·04	0·01	0·06	12·8	2·8
Grand Junction	19·00	0·90	1·06	0·01	0·07	12·8	2·9
SEPTEMBER.							
West Middlesex	19·04	0·81	1·02	0·01	0·05	13·0	3·0
Grand Junction	19·40	0·90	1·04	0·00	0·07	13·5	3·1

* The loss by incineration represents the amount of organic and other volatile matters contained in the Imperial gallon (70,000 grains) of water. The total solid matter, *minus* such loss, consisted chiefly of carbonate of lime, with small quantities of other equally harmless salts.

The water of both Companies was bright, clear, and almost colourless during August and September, and there was a decided diminution in the amount of organic matter contained in them.

SINGAPORE GAS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held at Cannon Street Hotel, on Tuesday last—H. P. STEPHENSON, Esq., in the chair.

The following reports and accounts were presented to the Shareholders:—

The Directors have to report continued progress in the lighting of Singapore, for particulars of which they refer to the report annexed, from their Engineer and Manager, Mr. E. J. Wells, dated Aug. 24, 1878. The original public light contract having expired on May 24 last, a new contract has been entered into for a period of 16 years, with an option on the part of the Municipal Commissioners to extend the time to 21 years, on terms which the Directors consider fair and equitable. The Municipal Commissioners have at the same time undertaken that they will not, during a period of 21 years, grant a concession similar to the one held by this Company for lighting Singapore with gas, to any other Company.

The balance-sheet to June 30, 1878, appended to this report, shows the financial position of the Company. The Directors have written off for depreciation of works and plant, and off the expenses of first establishment, as per balance-sheet, at the rate of 1 per cent. per annum. The profit for the half year, after writing off these sums, amounts to £2542 3s. 1d., which, together with £324 7s. 4d., the unappropriated profit of the preceding half year, makes the available balance £2866 10s. 5d.; out of this sum the Directors recommend the declaration of a dividend at the rate of 7½ per cent. per annum, less income-tax, on the amounts paid up on the preference and original capital; the balance of £554 12s. 2d. to be carried forward to the profit of the succeeding half year. The dividend to be payable on Nov. 20.

Report of Engineer and Manager.

Gas-Works, Singapore, Aug. 24, 1878.

Gentlemen,—By the French mail leaving to-day, I have the honour to forward to you the accounts and statements showing the working for the half year ending June 30 last. I have also attached to the statements the bankers voucher, showing the balance at Singapore on June 30 last. I trust all the documents will reach you safely, and be found correct. It gives me great pleasure to be able to report that there has been a satisfactory increase in the gas-rental over the corresponding period of last half year, amounting to 1287.80 dols., and that the sales of the residual products have shown good returns, the increase over last half year being 2909.47 dols. The general expenditure and all other matters being fully detailed, it is not necessary for me to go into figures.

Rates of exchange in the half year have again affected us very seriously; the average rate on the £3900, remitted at six months bank bills only, has been 3s. 11⅞d. per dol., showing a loss of £502 0s. 5d. There are no signs of improvement; in fact, matters are worse. On the six months bank bill I send you to-day, 3s. 10d. was all that was attainable.

Upon the whole, the collection of the rental, &c., has been satisfactory. The amounts uncollected appear higher than usual; this arises from some heavy payments which could not come in until after the 30th of June—they have been paid since.

In the carbonizing department, all is working satisfactorily. Two benches of retorts have been repaired, and are ready for use when required: No. 1 bench has been taken down, and is ready for re-setting with new retorts as soon as they arrive by the *Bristow*. The new purifiers arrived safely ex *Wemyss Castle*. Some alterations had to be made in the buildings for the purifying department; these have been made, and the purifiers and connections will now be erected as speedily as possible. The general efficiency of the works and plant has been maintained, and we are in a good position for produce and supply.

The increase in lights during the half year has been 474, and in houses fitted up, 41. We are now engaged—in addition to the ordinary routine of fitting work—in fixing devices nightly for illuminations for the Chinese annual festival. The gas has been kept free from impurities, and the illuminating power maintained at 15 candles.

The loss by unaccounted-for gas in the half year has been 13½ per cent. Perhaps a few words on this would not be out of place. A great number of the services have been laid down for a long time; during the past half year a general examination of them has been made, a number have been partly renewed, and about 150 renewed altogether. Again, there are other causes which have a tendency to make the unaccounted-for gas come heavy, which are not known in English works. The condensation in the mains and services in the tropics is very heavy, and Singapore being such a wide and scattered district, requires long lengths of both mains and services. We have at present upwards of 30 miles of mains, and fully that length of service-pipe, and the extremes on three lines of mains running from the works are about 3½ miles. I am in hopes next half year to show a reduction in the unaccounted-for gas.

The last point I have to bring before you—and not the least important—is the renewal of the lamp contract, and concession for a further term. The original contract and concession expired on the 24th of May last, and, according to instructions received from the Directors, negotiations were opened with the Municipal Commissioners previous to that date, and were carried through successfully, as will be seen by the documents duly executed by the Municipal Commissioners, and forwarded to you by the mail which left here on the 21st of June; which documents I trust reached you safely, and will meet with your approval, and also that of the Shareholders.

(Signed) E. J. WELLS, Manager.

DR.—Balance-Sheet, June 30, 1878.

To Capital—		
£5 paid on 2,000 preference shares	£10,000 0 0	
£5 „ 10,597 ordinary shares	52,985 0 0	
		£62,985 0 0
Debenture bonds		550 0 0
Sundry creditors		361 4 2
Insurance reserve-fund		140 18 6
Profit and loss		2,866 10 5
		£66,903 13 1

CR.—Balance-Sheet.

By Cash at bankers, London and Singapore		£718 3 4
Ditto in hands of Secretary		4 14 6
Bills receivable		400 0 0
Office furniture		104 14 6
Cost of works and plant, as per last statement	£35,315 7 9	
Add extensions during the half year	615 10 7	
	£35,930 18 4	
Less depreciation at the rate of 1 per cent. per annum.	176 11 6	
		35,754 6 10
Purchase of land		1,118 2 8
Retort account		1,123 19 11
Stock on hand		11,019 19 4
Amounts charged to capital for travelling expenses, rent, preliminary expenses, and interest on capital during construction	£10,840 5 11	
Less amount previously written off	958 13 3	
	£9,881 12 8	
Less amount written off this half year, at the rate of 1 per cent. per annum	54 0 0	
		9,827 12 8
Gas, meter-rental, fittings, and sundries under collection to June 1		3,514 15 0
Gas, meter-rental, &c., for the month of June, and gas for public lamps for the half year		3,317 4 4
		£66,903 13 1

DR.—Profit and Loss Account, from Jan. 1 to June 30, 1878.

To Coal carbonized	£2,557 3 1
Lime and oxide	20 8 5
Trade and general charges	385 6 1
Rent, rates, and taxes	137 12 4
Directors and Auditors	210 10 0
Salaries and Collectors commission	756 8 0
Wages	419 11 7
Interest on loans and debentures	73 1 4
Loss on exchange	502 0 5
Bad debts and allowances	95 15 3
Retort account	150 0 0
Meter repairs and renewals	40 0 7
Depreciation on works and plant, and expenses of first establishment written off	230 11 6
Office furniture	10 0 0
Balance—profit for appropriation	2,866 10 5
	£8,454 19 0

CR.—Profit and Loss Account.

By Balance at profit and loss, Dec. 31, 1877	£2,647 16 3	
Less amount declared as dividend, after deducting income-tax on ordinary and preference shares	2,323 8 11	
		£324 7 4
Gas and meter rental		6,316 5 0
Products, profit on fittings, and sundries		1,814 6 8
		£8,454 19 0

The CHAIRMAN, in moving—"That the report of the Directors, with the balance-sheet thereto attached, be received, adopted, and entered on the minutes," said: The first matter I have to call attention to and congratulate you upon is the fact that we have renewed our concession with the Municipality of Singapore for a further term of 21 years—an exclusive concession—and we have entered into a new public lighting contract for 16 years, with an option on the part of the Municipality to extend that to 21 years by certain notice, if they should think fit. I do not consider it desirable at this meeting publicly to enter into the details of the contract. Most of the articles are similar to those of the former contract; but if any Shareholders would like to see and read it after the meeting, a copy is on the table, and they can examine it for themselves. The principal point of the contract is that we have obtained, through the energy of our Engineer (Mr. Wells), an increase of about 20 per cent. in the price for the public lamps—a very unusual thing, but I think in this case a very fair, equitable, just, and proper thing, for these reasons—that the price for which we originally took the contract for the public lamps was not too high, and since then the price of coal has certainly risen in Australia; the price of wages has risen; and, as you know very well, for some years past we have suffered a considerable diminution of income from the loss on exchange. Those circumstances having been put before the Commissioners, we did not get perhaps as much as we hoped we should get—I do not say we expected to get—but still, as we looked forward to get in the negotiations; but we think, on the whole, we have received a very fair and reasonable price, and a price certainly in excess by 20 per cent. of that, which we obtained before—that which, as I have already said, is just, reasonable, and fair. Turning to the accounts, and comparing them with the corresponding half year of 1877, there are only one or two items to which I will call attention. On the debit side of the accounts we have £3350 less of debenture bonds. Our debenture bonds now only stand at £550, and we hope, as these fall due, that we shall take them up and extinguish our debenture debt entirely. Of course, when companies can put themselves in that position, it is very desirable that they should do so, because I think nothing is more mischievous to a company than to have a large debenture debt occurring at periods at which sometimes it may be inconvenient to renew it. It causes some anxiety on the part of those managing the company in renewing a large amount of debentures. Our sundry creditors are a trifle less, and our balance of undivided profit, as compared with the corresponding half year, is £83 less. On the credit

side of the accounts, we have £4731 less in cash and bills receivable. Of course, that has gone to pay the debentures on the other side. We have £1900 less stocks; and we have £1548 more gas-rental in arrear and to be collected, which is somewhat accounted for by the increase of our rental, and there has been a greater difficulty in getting in money; but Mr. Wells assures us it is all right and all safe. As regards the profit and loss account, the coal carbonized has cost £143 more; but with that we have realized over £300 more gas-rental, and £67 more profit on products, fittings, and sundries. On the debtor side also the only point for remark is that our interest on loans and debentures has decreased £71, and our loss on exchange has increased £227, arising, as you know, from the great deterioration in exchange that has taken place. With these remarks, gentlemen, and expressing my willingness to answer any questions you may ask me, I have much pleasure in moving the reception and adoption of the report.

Mr. FOREMAN seconded the motion.

The CHAIRMAN: You will see that we propose to pay a dividend on the preference capital and the ordinary capital at the rate of 7½ per cent., less income-tax—the usual dividend, in fact.

Captain REINECKER said that, without being an alarmist, and taking into serious consideration the position of the electric light in reference to gas shares, he should like to hear the opinion of the Chairman, as a gentleman thoroughly conversant with all gas matters, regarding the subject. He thought that the more that was said at the present moment against the electric light, the more good would be done to themselves and to those who had a large interest in gas property. There was a spirit of panic abroad, and when an opportunity occurred they should try and allay it by the expression of opinions from those who were really able to deal with the subject. He hoped the Chairman would give his views in reference to it, as it might affect their property.

The CHAIRMAN, in reply, said he was afraid that if he addressed the meeting upon the subject, it was so large and comprehensive that he should keep them there probably for an hour or an hour and a half. He was afraid, also, that if he were to express publicly any opinion on the matter, he should be met on the other side, in the first place, by a statement that the opinion he expressed was due to his ignorance of the subject; and, secondly, that it was a prejudiced opinion. He rather anticipated that his opinion would be asked at the meeting, and he would therefore quote the words of a great advocate of the electric light rather than give his own opinion on the subject—he referred to the opinion of M. Hippolyte Fontaine, who had written a work on the subject, which had been translated into English by Dr. Paget Higgs, a gentleman intimately connected with Dr. Siemens, one of the greatest electricians in this country. By reading one or two small passages from M. Fontaine's work, he thought he would guide them very much more in the matter than if he were to express his own opinion on the subject. M. Fontaine, on page 168 of his book, said: "As I have said"—and they ought to bear in mind that this was from the great advocate of electricity, therefore he was quoting an opponent, and he thought this was a better way of dealing with the subject than by quoting a prejudiced opinion—"As I have said, the voltaic arc is eminently convenient for the lighting of large uncovered spaces, or large halls without interior partitions; but when it is required to light small spaces or subdivided localities, it is much more advantageous to employ gas, petroleum, or even ordinary oil. There are numerous works on the construction of small electric foci; but at the present day none of the means devised have given practical results." Again, on page 185, M. Fontaine said: "The electric light has already a vast field of application open to it, and chapters 7 and 8 treat of the great advantages attaching to its employment in a number of cases; but that it will some day entirely take the place of gas is extremely improbable. It has, in fact, only been since the introduction of the electric lighting that our admiration for the facility with which gas can be divided and distributed has been fairly aroused." He (the Chairman) thought he might further say, in M. Fontaine's words, "That it is not of so much importance to know what will be, as to know what is." Of course they could not be prophets; they could not go into the future and say what would be ten thousand years hence; they could only deal with the facts that were before them. He had given M. Fontaine's opinion, and if the Shareholders wanted any further information on the subject he would ask them to read Mr. Haywood's report, or Mr. Sugg's report which was made a month since; and if that did not enable them to form any opinion on the matter, he would ask them to go to see the electric light on the staircase of the Gaiety Theatre, and then they could form their own opinion on the subject.

The motion for the adoption of the report was then put and carried.

The CHAIRMAN moved—"That a dividend be declared on the ordinary and preference shares at the rate of 7½ per cent. per annum, less income-tax in both cases, on the amount paid up on their shares to June 30, 1878, such dividend to be made payable on Nov. 20 next."

Mr. FOREMAN seconded the motion, which was agreed to.

The CHAIRMAN proposed a vote of thanks to Mr. Wells, the Engineer and Manager at Singapore. He said that on the present occasion he would ask them to do that which they had not been in the habit of doing—namely, to make a substantial acknowledgment to him for his exertions on the special occasion which had lately occurred. They were always grateful to Mr. Wells for the energy and talent which he displayed in the service of the Company. He had no hesitation in saying that a large number of the foreign undertakings would get on very much better if the companies had men of the calibre and honesty and straightforwardness of Mr. Wells in their employ. This was a special occasion; and in asking the meeting to accord a vote of thanks to Mr. Wells, he would also, at the unanimous wish of his colleagues, ask them to present Mr. Wells with a gratuity of £250, in acknowledgment of the services and the assistance he had been to the Directors in making the contract referred to. He hoped and believed that this proposal would meet with the approbation of the Shareholders, and he would accordingly leave it in their hands.

Mr. HULETT seconded the resolution. He said he had had the pleasure of knowing Mr. Wells for some years before he went to Singapore, and he had also the pleasure of seeing him over in England since that time, and a more honest, industrious, and persevering man he thought it was impossible to have. He could only hope that some other companies, who were not doing so well, had such a manager as Mr. Wells; for he believed him to be strictly honest and confidential in every way.

The motion was put and carried unanimously.

Mr. RICE proposed a vote of thanks to the Chairman and Directors for the manner in which they had conducted the business of the Company during the past half year. He said he had been a shareholder from the commencement, and he might say he had never missed a meeting. He had had the pleasure on previous occasions of proposing a vote of thanks to the Chairman and Directors, but on the present occasion he thought that something more substantial ought to be done. He thought the time had arrived when they ought not to forget the services of gentlemen who had really paid so much attention to the interests of the Company. His proposition was—and he thought it was a very fair one to both the Shareholders and the Directors—"That so soon and so long as the Company half yearly pay a dividend on the ordinary shares at a rate equal to, or exceeding 8 per cent. per annum, the Directors be authorized to take half yearly their remuneration at an increased rate of £400 per annum, and, under the same circumstances, that they be authorized to pay the Local Committee at Singapore at the increased rate of £200 per annum." He thought that they should not forget the Local Committee, because he imagined they had been of great service in getting the concession; and, although they were absent, he thought it was but right that the Shareholders should think of them.

Captain REINECKER said he should be happy to second the motion, for the following reasons:—First, he thought it was only just and due that the services of those on the other side should be rewarded in a more ample way than hitherto. Their services had been very arduous in bringing the Company to their present state of prosperity; and a more favourable opportunity had not presented itself in the history of the Company, in which to ask the Shareholders to pass the proposed resolution. Another reason was that the Directors had hitherto been inadequately rewarded, and now they were asked to accept what was really their proper remuneration. There was also a third reason—because he approved of the principle that, in working for the Shareholders, the Directors were working for themselves; and he thought that the principle of mutual remuneration was a very good one, and should be more widely adopted in the different companies than it was at present. Before resuming his seat, he should like to thank the Chairman for giving what he considered his opinion on the electric light. The Chairman was so sound in his judgment that he (Captain Reinecker) was sure that he would never read anything to the Shareholders but what he would endorse himself.

The motion was put and carried unanimously.

The CHAIRMAN, on behalf of the Board, thanked the Shareholders for the vote of confidence; at the same time he would point out to Captain Reinecker that he should not accept anything he wished to put into his mouth. He had merely read M. Fontaine's opinion, but did not give it as his own. He wished the Shareholders to understand he had expressed no opinion of his own on the electric light. He thanked the meeting very much for the vote that had been passed, and for the increase of remuneration which had been proposed to be given to the Directors when they paid a larger dividend. The Directors themselves thought that it was a fair and reasonable arrangement, and they would be unwilling to accept an increased remuneration until the Shareholders had more than they received at present. As he understood the proposition of Mr. Rice, it was this—that so long as the Directors were able to pay 8 per cent. they would get the increased remuneration, but if, unfortunately, they had to go back to 7½ per cent., they would suffer as well as the Shareholders; that when there was an increase of dividend there would be an increase of remuneration, but when there was a less dividend the Directors would also have to suffer. This, he thought, was a very good principle, and he thanked the meeting very much for the vote that had been proposed.

Captain REINECKER said that, whilst they had been considering the services rendered to the Company by their officials and others who had been instrumental in bringing about the new contract, he did not think that they should overlook one gentleman whose connection with the Company had been from the commencement, and whose services, he considered, had been most beneficial to the Company in every way. He alluded to the services rendered by their worthy Secretary, Mr. Robert King. In considering the subject in connection with the new contract, if they could offer him anything in the way of a substantial gratuity, he should be very glad to propose it. He thought that for faithfulness and earnest and careful attention in the discharge of his duties as Secretary, Mr. King had very few equals, and the Shareholders wished to record their appreciation of those services in a substantial manner; and with the permission of the Directors, he would move that they now take into consideration whether they could not show their gratitude to Mr. King by a substantial recognition of his services.

The CHAIRMAN said that the Directors had contemplated dealing with that matter themselves; but if the Shareholders thought fit to do so, they had no objection.

Captain REINECKER thought the present occasion a very suitable one; and he proposed—"That in consideration of the services rendered to the Company by Mr. Robert King, a sum of fifty guineas be presented to that gentleman."

A SHAREHOLDER expressed his opinion that matters of this sort were always best left to the Directors.

Mr. HULETT seconded the resolution. He said he thought that Mr. King had acted very judiciously on the part of the Company. He did not allow any one to get a contract for him until he thought he had obtained the best market he could.

Mr. WILLIAMS said he should have had much pleasure in seconding the motion; but he was waiting to hear from the Directors what they proposed to do. If the Directors did the proper thing, he was sure that every Shareholder in the room would only be too happy to record his vote in favour of it.

The CHAIRMAN said he would tell the Shareholders frankly what the Directors contemplated doing; they contemplated increasing Mr. King's salary in the same way as the remuneration of the Directors would be increased—that so soon and so long as they paid 8 per cent. he should have an additional remuneration of 50 guineas a year, and that if the Directors or the Shareholders suffered, Mr. King would also suffer, and they would all suffer together. This was what had been contemplated; but he had no objection to the Shareholders dealing with the matter as they thought fit.

Captain REINECKER disclaimed any intention of going against the wish of the Directors.

The CHAIRMAN expressed his concurrence in the remarks that had been made in favour of Mr. King.

Captain REINECKER said he simply wished to record the opinion of the Shareholders as to the way in which Mr. King had fulfilled his duties.

Mr. RICE said he was sure that all the Shareholders would be favourable to the proposition of the Directors, who, if they saw their way clear, would hereafter do what they had promised. He thought they could not do better than leave the matter in the hands of the Directors.

Captain REINECKER concurred in this view, and withdrew his resolution.

The motion for a vote of thanks to Mr. King was then put and carried by acclamation.

Mr. KING in a few words returned thanks.

A vote of thanks to the Chairman brought the proceedings to a close.

SHEFFIELD WATER-WORKS COMPANY.

An Extraordinary Meeting of this Company was held on Monday, the 21st inst.—Mr. W. COCKAYNE in the chair—to consider the propriety of making a dividend on the ordinary shares of the Company for the years 1876 and 1877, out of the balance of income of those years remaining undivided.

The CLERK (Mr. R. B. Smith) read the notice convening the meeting, and the following report was presented:—

In pursuance of the course proposed in the two last annual reports of the Directors, they have applied to the Chancery Division of the High Court of Justice, by means of

a special case, for directions upon the question, whether the order made by Vice-Chancellor Malins in 1872, directing the charge to the Company's capital of interest on capital invested in the works and land, not yet utilized for the supply of water, continued to be operative under the altered circumstances of the Company.

As appears by the report and abstract of accounts laid before the last annual meeting, a sum of £39,644 16s. 2d., in respect of this interest for the years 1876 and 1877, was placed to a suspense account; and for those years no dividend on ordinary shares has been made.

The Court decided that £14,254 9s. 3d., being that part of the interest in question, for the years 1876 and 1877, which was paid in respect of the capital invested in the Dale Dyke reservoir and works, is properly chargeable to revenue, and the remainder of such interest to capital; and that, for the future, interest on capital invested in works, and land for works temporarily non-productive, is chargeable to capital until such works shall, in the opinion of the Company's Engineer, be fit to be filled with water, and to be used for the purposes of the Company.

In pursuance of this decision, £14,254 9s. 3d., part of the sum in suspense, must be charged to the debit of the revenue of the Company for the years 1876 and 1877, and the remainder to that of capital. The latter amount is by the Court ordered to be recouped from the capital to the Company's revenue for those years.

After such recoupment, the balance of undivided revenue for those years will be £24,886 2s. 1d., which the order declares is applicable to the payment of dividends on ordinary shares. This amount, if divided at once, would give a dividend after the rate of £2 13s. 10d. per cent. per annum on the ordinary shares of the Company for the two years 1876 and 1877, and the Shareholders at the proposed extraordinary meeting are competent, if they think fit, to make that dividend. The Directors, however, believe that it would be more beneficial to the Company to make at the present time a dividend for those years after the rate of 1 per cent. per annum only, and they recommend that such dividend be made, and that it shall be payable in the usual manner on the 14th of November next. This will absorb £9237, leaving £15,649 2s. 1d. undivided revenue to be carried forward, which can be used for the equalization of the future dividends of the Company.

The Directors consider it right on this occasion to inform the Shareholders that they propose in the course of the present year to make an intermediate dividend on the ordinary shares for the half year ending June 30, 1878.

The CHAIRMAN: So far as the Directors are at present able to form an opinion, they will be able to make a dividend for the half year ending the 30th of June last after the rate of 2 per cent. per annum, which will be paid before Christmas. That will be in addition to the dividend now about to be made at this meeting. I have now pleasure in moving—"That a dividend shall be, and is hereby, made on the ordinary shares of the Company, for the years 1876–77, out of the balance of income of those years remaining undivided; and that such dividend shall be at the rate of 1 per cent. per annum; and shall be paid by the Sheffield Banking Company, in George Street, Sheffield, on the 14th day of November, 1878; and that the sum of £15,649 2s. 1d. which remains of the said balance of income shall be carried forward in the books of the Company as undivided income, and shall be applied accordingly." Everything is so very clear that it is almost unnecessary for me to say anything. I see Mr. Barber is here; I will therefore ask him to second the resolution, and make a few remarks upon it.

Mr. J. H. BARBER: I have been asked to second the resolution the Chairman has moved, and, agreeing with the purport of it, I have pleasure in doing so. I gather from the statements made in the report which has been read, that the broad question, whether it is desirable to pay dividends out of interest on capital expended for unproductive works, is not before us. That appears to be settled by the decision of the Court of Chancery. Therefore, the question is, how we shall appropriate that sum which the Court has determined shall be legitimately divided—whether the Shareholders shall take the whole of the £15,000 now, in addition to the £9000 which the Directors propose to spend to make up the dividend of 1 per cent. per annum for the two years, 1876–77, or whether they will carry forward the £15,000 for the sake of equalizing future dividends. In looking at the question, it seems to me that it is extremely important that the Shareholders should bear in mind the fact that there is in their property a value independent of what it will at present produce; that, in point of fact, there is a principle of growth—of increase of value—in the shares of the Company. I believe it is more politic that this principle of growth should show itself year by year, than that you should make larger dividends in one year than you can keep up in succeeding years. I think it is calculated to be harmful to your property, and to the position of the shares, to be paying £2 13s. 10d. for the years 1876–77, and a smaller dividend in 1878, and perhaps a still smaller dividend in 1879. Then, I say, come at once to the lowest point which you are ever likely to have to reach, and after that go steadily up. There will come a time when it will not be possible to be forming a fund for the payment of dividend out of the interest upon unproductive works, and when there will be a trial point for the Company's revenue. With that view, I feel strongly that it is more politic to begin by paying a lower dividend of 1 per cent. for 1876–77. I am glad to hear that in 1878 the dividend is to be 2 per cent.; and I trust we shall never have to go below those rates, but rather that in each succeeding year there will be an increase. The reason may, perhaps, be asked why one has such a hopeful feeling with regard to the future dividends of the Company. It seems to me that the property of the Company is bound up in Sheffield as a whole. If the town is never again to increase, and never to become prosperous, the future of the Company, no doubt, is gloomy; but those of us who, as I do, recollect Sheffield when it was just one-third of its present size, and who have seen the town in many fluctuations of prosperity, can remember the time when there were far more empty houses in it than now. I remember the time when there were 8000 empty houses, and, therefore, I am slow to believe that the time has arrived when the increase of Sheffield is at an end, or that we must expect things to remain such as they are. We cannot but expect that with returned prosperity, and improved trade in Sheffield, there will also be an improvement in the Company's revenue; but yet, even apart from all that, there are some hopeful signs. The value of the shares has had a tendency to rise, on the whole, and although at present the dividends may not be what you would wish to receive, you must bear in mind that these small dividends are the result of your looking a generation ahead. Instead of having, like Manchester, to go to the Lakes for your water supply, you have within a few miles of you an abundant supply of the finest water. You have, in point of fact, provided it not only for yourselves but for your children's children. That was the wisest policy. If your gathering-ground had been small, you would, in the course of a few years, have been obliged to get a fresh one, and that, perhaps, would not have been done without opposition, probably from rival companies; but by holding together and resisting the attacks made from within and without, you have placed yourselves just in a position in which you can take advantage of that prosperity which will ultimately come. I have only one other observation to make. The recommendation of the Directors has great weight with me. Whatever else may be said of them, they are steady, honest, thoughtful men, such as you would take, individually, as trustees to manage your own affairs, if you found it necessary to choose men on whom you could place reliance. They know more than the Shareholders do as to the prospects and the future of the Company, and their recommendation has very great weight with me.

Mr. F. E. SMITH moved, as an amendment—"That the dividend for the past two years be at the rate of 2 per cent. per annum." He said: I have not heard in the statement made by the Chairman, nor in the circular the Directors have sent out, any reason whatever assigned why the Shareholders should not have the dividend to which they are equitably entitled. Some years ago the Company paid for a considerable time 4 per cent., if not more. I believe they at the present moment are in a better position than when they were paying 4 per cent. After a while, however, there were certain persons who thought it was not desirable to go on paying dividend out of capital, and so the point was tested; and, under the advice of the Law Clerk of the Company, the Directors said: "We will not pay 4 per cent. in future, until we have applied to the Court of Chancery, and we will not pay any dividend out of revenue until we have applied to the Court of Chancery, to see whether we are justified in doing so." They did apply to the Court of Chancery, and we were more than two years in getting their decision. When we did get it they said: "You can legally pay £2 3s. 10d. per cent. per annum;" and the Directors now recommend a dividend of 1 per cent. I cannot see the reason and justice of that, and I have not heard anything to-day, from the Chairman, why it is so. I cannot define why we should only get a dividend of 1 per cent. when we are entitled to £2 13s. 10d. per cent. There are two classes of Shareholders; but there are more holders of ordinary stock than of preference stock. The latter have had their dividends regularly, but the holders of ordinary stock have been suffering and starving for 2 years, or 2½ years, and now there is a chance of the promised dividend, it is proposed that we should be kept out of it.

Mr. G. HIDES, in seconding the amendment, said that, looking at the matter as business men, he thought the Directors would be justified in increasing the dividends of 1876–77 to 2 per cent. He based his statement on the information in the report sent to the Shareholders. If he recollected aright, after recouping the dividend, as ordered by the Court of Chancery, £14,000 odd, there was left an available balance of nearly £25,000. If the dividends of 2 per cent. on 1876–77 were paid, they would take a little over £18,000, leaving a balance in hand of £6500 towards the dividend of the current year 1878, while the works they were authorized by the Court of Chancery to charge the dividend on, would give a round sum for the current year. In the current year (1878) the Company would be in a position to add to the £6500 balance, £12,000 interest on unproductive works—perhaps more, certainly not less. If 2 per cent. dividend were paid for 1876–77, there would be at the end of this year £18,000 to deal with. Then, supposing the Company paid £9000 this year, after the rate of 2 per cent., they would have a balance on the 1st of January next of more than £9000, which was equivalent to a dividend of 2 per cent. in 1879. He would have been glad if the Directors had taken the Proprietors a little more into their confidence. The Chairman might have told them that there was really a substantial increase in the Company's earnings over last year. He knew that to be the case. So that, in addition to the balance of £9000 at the beginning of next year, there would be the increase in the current year, and that would assist in the year 1880. Further, they were introduciug water immediately to Chapeltown, and he believed the supply there would yield them £1000 a year. This must strengthen their position when they dealt with the funds of the Company, in order to give the Shareholders 2½ per cent. He thought they would be able to pay 2 per cent. this year and next, and with increased prosperity they would be able to continue that dividend beyond next year, with perhaps an increase upon it.

Mr. HOBSON said he did not intend to have been present at the meeting, but hearing that an amendment was to be proposed in favour of a 2 per cent. dividend he decided to attend. Mr. Smith no doubt had the interest of the Water Company most seriously at heart, but he (Mr. Hobson) did not know anything more injurious than for them to pay the higher dividend proposed. He would prefer that the Directors paid no dividend; but 1 per cent. was far more reasonable than 2 per cent., for the accounts of the Company for last year showed that the amount received for rents, &c., was not sufficient to pay the interest on the debentures and preference shares by £565 17s. 5d. He had made a calculation showing that something like £70,000 of dividends had been paid out of capital. If the policy of Mr. Smith were adopted, £18,300 would be taken out of the capital of the Company. On the whole, he thought it would be better for the amendment to be withdrawn.

Rev. G. SANDFORD said he had often spoken in favour of economy and retrenchment, and when he considered the liabilities of the Company and the depressed state of trade in Sheffield, he strongly recommended that the dividend should not exceed 1 per cent. for 1876 and 1877. He therefore supported the Directors proposal.

In reply to the Clerk, Mr. F. E. SMITH said he proposed that a dividend of 2 per cent. should be paid for the past two years, as an amendment to the proposal of the Directors that the Shareholders should only receive 1 per cent.

The CLERK: Do you object to the other part—the part relating to the carrying forward of the £15,000?

Mr. F. E. SMITH: I only propose that the 2 per cent. should be paid, and the Directors may do as they please with the remainder. If you decide to give the Shareholders 2 per cent. you will still have so much in hand, and you can bring it forward on revenue account.

It was ultimately decided that the amendment in favour of a dividend of 2 per cent. should also contain the instruction that the balance remaining after the payment of the dividend should be carried forward.

Mr. BARBER asked to be allowed to make a few observations on points referred to by previous speakers. He said he almost entirely agreed with Mr. Hobson's general principle, and if it were possible to determine that the principle gone upon, of paying no interest out of unproductive capital, should be proceeded with, he would be in favour of it. He believed that the decision of the Court of Chancery was a *bonâ fide* one, and that there was really £24,000 to be dealt with by the Company. The question was simply whether they should divide it now or at some future time; and looking at the fact that some day they might drop £1000 a year, it would be advisable to prepare for such an eventuality, and not have a time come when there would be no dividend at all.

Mr. P. SMITH said he wished to make a few remarks by way of explanation. He thought a great many of the speakers were very much confused as to the nature of the matter to be dealt with. Two or three gentlemen had talked about making a dividend out of capital. Now, if they looked the thing fairly in the face, that never had been done. The position of the case was this: The Company had a quantity of finished works which had been making a fair profit on their own merits. They had other works which were in a state of progress, but they were not ready to be utilized. Interest on these unproductive works had to be paid from some source or another, and the question was whether the ordinary Shareholders should pay it out of the yearly earnings of the finished works, or whether it should be looked upon as part of the cost of the unfinished works, and added to the cost of those works. That question had been put by a special case before the Court of Chancery, and the Court had decided that the interest on non-productive works, so long as they were not in a fit condition to be used, was to be part of the cost of the works. Year by year capital was to be raised to pay interest on those works, and by that means it left the ordinary revenue free to be divided amongst the Shareholders. No capital was ever divided. During the two years 1876–77, the revenue of the Company had been £132,890, and the expenditure on revenue account £93,689, leaving a balance of clear profit of £39,140 upon works. Then came the question, was not all this interest on the unfinished works to be charged against that £39,140? The Court of Chan-

cery decided that £14,254 was a proper charge against that revenue, and this left a balance of £24,886, which was appropriated in the way of dividend. The Court said that it might be paid for dividend for these two years, and it was competent for the Shareholders to divide it, or to carry any portion of it forward, to make a dividend of the whole of it on the present occasion, or fall in with the recommendation of the Directors, and divide only a portion of it, leaving the rest to be carried forward to equalize future dividends. The reason the Directors recommended only 1 per cent. had been very fairly stated by Mr. Barber. He thought it a bad thing that the Company should pay a large dividend one year, and a smaller one the next. It was much better to find the lowest point, and, if possible, increase year by year upon that. The Directors could hold out no positive promise as to the future. The Company were in a very satisfactory condition, considering the state of trade, and the Directors hoped, if the 1 per cent. were divided for these two years, not only to be able to divide 2 per cent. this year, but also keep up the 2 per cent. in perpetuity, and probably at some future time make a larger dividend. The Directors were just as anxious for good dividends as any of the Shareholders could be. The question really was, whether it was not much wiser to equalize dividends than to go by fits and starts. The other parts of Mr. Smith's speech were matters that the meeting had nothing whatever to do with. The meeting was called for the purpose, in the first place, of deciding whether there should be a dividend or not; in the second place, to decide what should be the amount of dividend, and when it was to be paid; and in the third place, to decide what should be done with the balance, if the dividend did not absorb the whole amount. The Directors proposed that a dividend at the rate of 1 per cent. per annum should be paid, and that the balance of £15,000 be carried forward. If the revenue increased, the dividend could be raised to 2, 3, 4, or 5 per cent., as the case might be. In reply to Mr. Hides, he might say that the Directors had had all the figures laid before them. They had gone through them very carefully, and it had not been without much consideration that they had fixed the amount of dividend at 1 per cent. for the two years. He thought that was as much as they could safely divide, and the Directors believed the course they recommended would be the best. It would equalize the dividend, which could be kept up, and, they hoped, gradually increased. That was much better than giving a large dividend now, and perhaps next year saying they could not give any at all, or considerably less than the present.

The CHAIRMAN then put the amendment to the meeting, and the show of hands being considerably against it, it was declared to be lost.

Mr. F. E. SMITH objected to the decision, and demanded a poll.

The meeting then divided, when there was found to be a large majority against the amendment.

The original motion was then put and carried.

The demand for a poll having been withdrawn,

Mr. EADON moved, and Mr. F. E. SMITH seconded, a vote of thanks to the Chairman, and the proceedings terminated.

ODESSA WATER-WORKS COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held last Thursday, at the Cannon Street Hotel—Sir FRANCIS S. HEAD, Bart., in the chair.

The SECRETARY (Mr. Emanuel Allen) read the advertisement convening the meeting, and the report of the Directors was taken as read. It was as follows:—

The Directors beg to submit the interim accounts for the half year ending June 30, 1878.

A comparison with the corresponding half year of 1877 shows—

	1877.	1878.
Expenditure at Odessa	£12,035	£13,704
Do. in London	1,439	1,404
	£13,474	£15,108

while the water-rents show a receipt of £17,985 for 1878, as against £16,149 for 1877, and £18,703 for 1876.

The increase of expenditure at Odessa is chiefly due to the enhanced cost of material, coal, and labour. The war must account for the two first, but wages have risen with the depreciation of the Russian currency, which also greatly diminishes the real value of the receipts of the Company.

It will be seen from the report of the Resident Engineer that during the past six months the Company have pumped up to a height exceeding 300 feet, and conveyed from the Dniester to Odessa, a distance of 24 miles, at a pressure of 63 feet above the highest point in the city, 470 million gallons of filtered water. Out of this quantity only 227¾ million gallons were charged to consumers, the remainder being water supplied gratis to the Municipality under the arbitrary terms of the contract, or loss due to causes explained in previous reports.

But while the consumption at present chargeable amounts only to 227¾ million gallons, it must be remembered that the works of this Company, executed under the most rigorous surpervision of its Municipality, were constructed to supply Odessa with nearly five times this quantity, besides provision for a large reserve supply in the storage reservoirs in the town, the capacity and intention of the city to consume this quantity of water being peremptorily insisted upon. No sooner, however, were the works complete, than the Municipality took every means to minimize the liability of each inhabitant to use water, as well as the price he was to pay for it.

In a city where water was often retailed as a luxury, at a fancy price per bucket, a magnificent system of water-works has now been constructed which will more than bear comparison with any in Europe; but experience has shown that no fair return for the cost of these works can be expected from the voluntary action of the Municipality, though the Directors have always believed in the possibility of obtaining substantial redress and assistance from the Government of the Czar, if the monstrous nature of the contract under which this Company is being literally starved to death could be made clear to his Ministers.

Political difficulties have repeatedly interrupted that harmony between England and Russia which is so desirable for general commercial interests as well as for those of this Company, and at the present moment a more cordial understanding might be wished for; but the necessity for redress is so urgent that the Directors contemplate making at once a special representation of their case at St. Petersburg, which will, they hope, definitely decide whether this noble creation of foreign capital shall be handed over, as a legal prize and windfall, to the inhabitants of Odessa, or receive from the Supreme Authorities that recognition and support which its great outlay and services so eminently entitle it to expect.

The Directors are extremely sorry to report that Mr. Freer's health will not permit him to remain in their service. He has not only performed his duty to their entire satisfaction, but for 4 months out of the 16 that he has been at Odessa, he has had to do Mr. Michell's work as well as his own during the absence of that officer on holidays claimed under his agreement. On those occasions the Directors were much pleased with Mr. Freer's conduct of their business.

They have appointed Mr. Walter Bradbury to succeed him as Resident Engineer to the Company at Odessa.

Report of the Resident Engineer.

Odessa, Aug. 24, 1878.

T. Michell, Esq., C.B., Odessa.

Sir,—I have to report that 469,886,520 gallons of water were pumped into Odessa from the Dniester in the six months ended the 30th of June last, as against 480,035,080 gallons pumped during the same period of 1877—a diminution, therefore, of 10,148,560 gallons.

The quantity of coals used for this work was 1536 tons, or 3·26 tons per million gallons pumped; a considerable portion of this coal (1225 tons) being Silesian has caused the duty of the engines at the Dniester to be somewhat lower than usual.

No accident of any consequence has taken place during the half year, and I am glad to say that we have fewer leakages on the mains than formerly.

The working plant of the Company is in a fair state of repair.

The number of meters fixed during the half year was 226, the total number now in use 2471, and the number of new services connected with the Company's mains was 71.

(Signed) A. V. FREER, Resident Engineer.

DR. *Capital Account, for the Half Year ended June 30, 1878.* CR.

Capital expenditure to Dec. 31, 1877, as per last accounts	£954,069 4 0		A shares preferred— 30,000 shares of £20 each	£600,000 0 0	
Balance carried to general balance-sheet	45,167 16 0		B shares deferred— 12,472 shares of £20 each	249,440 0 0	
			Debenture bonds, 6 per cent.	143,050 0 0	
			Debenture stock, 5 per cent.	6,747 0 0	
	£999,237 0 0			£999,237 0 0	

Authorized share capital—

A preferred shares, 30,000 of £20 each	£600,000 0 0
B deferred shares, 12,500 of £20 each	250,000 0 0
	£850,000 0 0

DR.—*Revenue Account, for the Half Year ended June 30, 1878.*

To Expenditure at Odessa—		
Salaries and wages at Odessa and Dniester	£4711 16 8	
Coals	5359 14 7	
Stores, maintenance of works, and general working expenses	2001 18 9	
Expense of water sales, &c.	388 5 9	
Rents, rates, and taxes	240 6 10	
Office expenses, stationery, fire insurance, travelling expenses, &c.	542 10 8	
Law charges	459 19 7	
		£13,704 12 5
To Expenditure in London—		
Directors and auditors fees	676 5 0	
Salaries of Secretary and Clerks	390 0 0	
Rents, rates, and taxes	134 7 4	
Law charges	115 18 9	
Miscellaneous charges, printing and advertising	87 18 10	
		1,404 9 11
		£15,109 2 4
Loss by exchange on salaries and remittances from Odessa		1,602 3 0
Interest on debenture bonds and 5 per cent. debenture stock issued		4,545 6 4
		£21,256 11 8

CR.—*Revenue Account.*

By Water rents	£17,985 11 9
Meter-rents	795 1 4
Miscellaneous receipts	366 4 10
Transfer fees	8 12 6
Balance carried to balance-sheet	2,101 1 3
	£21,256 11 8

DR.—*General Balance-Sheet.*

To Loan from Bankers			£10,000 0 0
Sundry outstanding accounts			1,360 7 4
Interest accrued on debentures and debenture stock, and provided for			1,875 17 6
Debenture interest outstanding, including income-tax unpaid			469 17 6
Deferred dividend warrants issued, less portion converted into 5 per cent. debenture stock			8,193 18 3
Capital account, balance at credit thereof			45,167 16 0
Revenue account—			
Balance at Dec. 31, 1877	£4,258 14 9		
Add amount then estimated for loss on Exchange	£3,557 10 1		
Actual loss	3,101 9 1		
		456 1 0	
			4,714 15 9
			£71,782 12 4

CR.—*General Balance-Sheet.*

By Cash at bankers in London			£978 16 5
Ditto ditto on deposit			8,000 0 0
Ditto to meet debenture coupons unpaid			469 17 6
Ditto at bankers, and in hand at Odessa	£7,937 6 3		
Less provision for loss on exchange	1,568 15 10		
		6,068 10 5	
Bills receivable on hand			202 14 2
Stock of tubes, fittings, &c., at Odessa			33,702 8 6
Stock of coals at Odessa			6,103 15 2
Office furniture and leases in London and Odessa			1,926 4 8
Sundry debtors			6,305 5 11
Expenditure in suspense, as per previous accounts			6,423 18 4
Revenue account—			
Balance at debit for half year to June 30, 1878			2,101 1 3
			£71,782 12 4

The CHAIRMAN, in moving the adoption of the report, said on the present occasion the accounts were merely interim, and he had nothing to say about them except that they were given more in detail. The gross expenditure did not show very favourably as contrasted with the receipts, and he was sorry to say that it contrasted still more unfavourably if they took the actual receipts at the present price of the rouble—say 2s. In that case the actual water receipts, instead of being £17,985, would be only £13,309. That was a matter which the Directors could not control. The report stated that "the increase of expenditure at Odessa is chiefly due to the enhanced cost of material, coal, and labour." With regard to material, that referred chiefly to stores, and although the aggregate amount of stores was not greater than it was at the corresponding period of the previous year—they had been as economical as they could during the time—still the cost was increased by the war. They used up their old stores at the end of last year, when they had to purchase fresh stores, for which they paid a higher price. With regard to coal, they were supplied with English coal up to the end of 1877, and he thought they were rather fortunate in having so good a supply, under the circumstances; but, of course, the continuance of the war made it necessary for them to supply themselves with coal where they could get it. They were therefore obliged to purchase Silesian coal, which was not only dearer on account of the land transit, but also inferior in quality, and this had caused a very considerable increase in the past six months. This was not an unexpected increase, for they referred to it in their last report, from which he quoted. He thought they might rather congratulate themselves that the increase was not greater than it was, and he might add that it was partly owing to a rather unfortunate cause—namely, that the steamer conveying their first cargo of coal, sent out immediately after the war, broke down shortly after leaving Cardiff, and had to put into Falmouth. They had therefore to buy 300 or 400 more tons of coals on the spot, instead of being supplied with English coal, as they would have been but for this accident. As the report said, the increase of materials, or stores and coal, was occasioned by the war, and as the war was now over, their expenditure during the current six months would resume its normal condition. Wages had risen with the depreciation of the Russian currency, and he had told them that this cause had diminished their receipts. The report went on to refer to the amount of water they had pumped up, and the condition they were in through the short consumption of the city, and the high pressure they

were obliged to maintain under the contract. The report then alluded to the construction of the works, which were made to supply Odessa with nearly five times the quantity of water now paid for—that was to say, that it would have been 986 million gallons for the half year. Then, in addition, they were obliged to maintain under the contract, but equally unnecessary, a constant reserve of 2¾ million gallons. Their works would bear comparison with any in Europe, as regarded excellence of construction. Reference was then made in the report to the experience of the Company for the last four or five years. They had been trying for a long time, but in vain, to get some return adequate to the outlay they had been compelled to incur in supplying the great city of Odessa with water. They had told the Shareholders on previous occasions how impossible it had been to obtain any attention from the Municipality. They had heard in that room from Mr. Michell that he had an idea that the Municipality could be persuaded into doing more than they had. For a long time Mr. Michell had *carte blanche* in the matter, and made no progress, and they had tried in every way to obtain redress, and they could not. The Municipality had practically been in abeyance for the last twelve months, and the Mayor, who went away on the plea of ill-health, had lately resigned. The Company's requirements had been before the Municipality for three years, and they had not yet been looked at. The Municipality had offered to appoint a commission, but they (the Directors) knew that this merely meant the shelving of matters. Experience showed, in fact, that these gentlemen were perfectly satisfied with getting their water, and in return were not the least disposed to pay one shilling more than they were obliged. Under these circumstances they had to consider what was the best course for the Company to follow, and they had long been of opinion that there was only one source from which they could hope to obtain redress, and that was the Imperial Government at St. Petersburg. There was no doubt that, theoretically, the Imperial Government were entitled to say, "You have made a bargain with the Municipality, and the Municipality are managers of their own affairs at Odessa, so we cannot interfere." That, theoretically, was true enough, but, practically, the Government, if they chose, had the means of carrying out in Odessa what they liked; and if they could obtain their assistance he had no doubt that the perfectly just and honest requirements which the Directors had laid before the Municipality could and ought to be admitted. What were those requirements? They were not long, and they consisted simply of this—that they asked in those requirements for the ordinary privileges and rights which were granted to any water company in Europe. They asked for nothing more. They asked that the universal practice of water companies should be adopted in their case, and this comprised, he might almost say, all their requirements. If such requirements were to be ignored, as they had been, completely by the Municipality, the result to the Company was certain—that they could not, after the outlay they had incurred, go on supplying water at a price which positively hardly paid their working expenses; in fact, at the present price of the rouble, it did not pay their working expenses. The ground upon which they must approach the Russian Government was one which he had hinted at repeatedly, and one which he thought, on consideration, they would see the justice and wisdom of listening to. They might assume that Russia was anxious, and it was for her interest, to attract foreign capital rather than repel it; and how could they expect to attract English capital for enterprises, when one like the Odessa Water-Works was unable to obtain those ordinary conditions which, in any other country, legislation would give them at once? The fact was that Russia, though a great empire, was in many respects undeveloped, and they had not recognized the existence—if he might say so—of water companies. At that moment the Odessa Water-Works Company had no existence in Russia, and if he, as Chairman, or the Directors as the Board representing the Company, addressed themselves officially to the Russian authorities, they would be met with the reply, "We don't know you—we don't know the Odessa Water-Works Company." The system of joint-stock companies and joint-stock legislation, which was so well understood in England, and the rights to which water companies were entitled, were all things which had yet to be explained and learnt in Russia. In short they had a case which, he thought, if it could be properly brought before the Russian Government, was, to his mind, as a matter of policy unanswerable; and he firmly believed, or he should not advocate it, that if they could persuade the Russian Government that it was for her interest, not as a favour to the Company, but for them, as a matter of wise policy, to grant the Company the very moderate requirements they asked for, he thought they might hope for success. At the same time it was a difficult business, and a great deal would depend on the person to whom was entrusted the duty of explaining their case. Upon that point he hoped he should receive the support of the meeting in saying that they hoped to find some gentleman whose rank or political position would entitle him not only to access to the Russian Ministers, but also to that consideration which a person in that position would be entitled to receive, in the opinions he expressed upon the practice and legislation of England and elsewhere. He need not tell them that on the person so selected a great deal would depend, and he was quite sure that they would support the Board in any arrangement they might make for obtaining the service of such a gentleman. He hoped to find some one to whom a visit to St. Petersburg would not be unwelcome, from the general interest he might take in the state of affairs—he might call them European interests—now existing in Russia, that he would go on public grounds on that account, and that he would be chiefly influenced by the desire to rescue an honest and deserving English company from the ruin which hung over them. He believed that this would be the ruling influence in the mind of the person whose services he should hope to obtain. At the same time there were certain things which he should imagine, as a matter of course, that no one in the room would be disposed to question. Of course, the expenses of such a gentleman would have to be paid; but it was difficult to say anything beyond that just now. It was very possible that what he had mentioned would be sufficient. He hoped they would thus be able to obtain their list of requirements, and, above all, the carrying out of the system of sewers, as to which he might mention that it was entirely within the power of the Government to compel the city of Odessa to execute the sewers, to provide a main outlet for the sewage, which they had never done yet, but which they promised to do before the Company's works were constructed, and upon which a great deal of the prosperity of the enterprise depended. He should assume that the meeting would cordially support the Board in such an arrangement as that at which he had hinted, and which, he was certain, was the one hope for the Company to escape from the dangerous position in which they were at that moment. He had tried, since he had been Chairman, to speak plainly and openly on all matters, and he did not disguise from them for a moment that, however excellent their works might be, however effectively they might perform their duties, they could not go on as they now were unless their requirements were granted, and unless they received the justice to which he had referred. They would have a certain amount of debentures falling due next spring, and he need not tell them that, although they had always paid the interest on these debentures, still a great deal would depend on the position of the concern, in respect to the matters to which he had been alluding, as to the willingness of the parties concerned to renew those debentures for a further period. He did not wish at that moment to go into many causes of complaint which they had against a variety of persons; but he might say that those complaints were not wanting, and he thought that, if fairly put before the Imperial Government, they would see that the condition the Company were in was one which would not bear exposure on being looked into. In reply to one or two suggestions from certain Shareholders, he might inform them that long ago, before these suggestions were made, he had seen Count Schouvaloff, and also M. Bartholomei, the gentleman at present acting for the Russian Ambassador in this country, and from those gentlemen he had always received very courteous treatment. Their position precluded them from taking any active part in the matter, but they had in various ways facilitated applications which he had made at St. Petersburg, and there was nothing that he could wish for other than what he had received, as far as the Russian Embassy was concerned. He thought the report of the Directors, and what he had now stated, would explain pretty clearly the position the Company were in, and, pending an application of the kind contemplated, they must wait and see what could be done. With regard to minor matters, he mentioned that their lawsuit with Mr. Schwaben was still pending, and had been referred to arbitration. Mr. Schwaben claimed a large amount from them, and all he could say—and, the matter being *sub judice*, one could say very little about it—was that they were not indebted to Mr. Schwaben, but that that gentleman had rather been overpaid. This matter, however, was before the arbitration of Mr. Turner, and the first meeting would take place next week. As to the retirement of Mr. Freer, the Board were very sensible of that gentleman's services during the 16 months he had been with them; and he was very sorry that they were going to lose him, particularly at that moment, because he (the Chairman) had received that morning a letter—which he read—from Mr. Michell, stating that he intended to resign his appointment at an early date. He next referred to the appointment of Mr. Bradbury, who, he believed, was a gentleman of great natural abilities, and spoke several languages. He had been in several good establishments—those of Mr. Hawksley, Mr. Simpson, Mr. Church, and the late Mr. John Aird, and he hoped that Mr. Bradbury would soon adapt himself to the position he would have temporarily to occupy. He might say generally that, although they were in a difficult position, he had tried to place before them how the Company stood, and they hoped to get redress from the Imperial Government. If they were successful in getting what, after all, was the barest justice, he had no reason to despair of the future of the Company. Odessa had been in difficulties, but they heard that there was every inclination to make Odessa a greater city than it was; to make it the seat of Government in the Black Sea; and, in short, to increase its size and importance. If, under these circumstances, the Company went to ruin it would not be the fault of the Directors. There was no doubt that their water-works had been of the very greatest possible importance in the late war, as without the Company's water the troops could not have been concentrated at Odessa, although the bill for the supply of water to the troops was not yet settled. He mentioned this to show the importance, politically and commercially, of their works to the city, and they would be of still greater importance if what he had indicated came about. He then moved—"That the report and accounts of the Directors submitted to this meeting be received and adopted."

Sir Arthur Clay having seconded the motion,

A long discussion followed, in the course of which considerable dissatisfaction was expressed at the want of management displayed, as shown in the position of the Company; but several Shareholders acknowledged the services of the Board in endeavouring to remove the difficulties by which the Company were hampered.

An amendment was moved appointing a Committee of investigation, &c.

The Chairman, in replying at the close of the discussion, said he was prepared to meet fully any definite charge made against the Board, but as to any vague charge or insinuation that he had withheld the truth he should simply deny it. He had been told that he spoke too plainly as to the position of the Company and their affairs. He had told them that day of the position of affairs, and of the necessity for something being done, and he indicated the course the Directors advocated to obtain redress and amelioration of the present condition of things. With regard to a Committee of inquiry, he had only to say they would have nothing to inquire into if appointed. The Board had done their very best to extricate the Company from their difficulties, and they would do their utmost to obtain that justice which they deserved.

The amendment was then put and lost, and the original motion was afterwards carried with a few dissentients.

On the motion of Mr. Tendron, a vote of thanks to the Chairman and Directors brought the proceedings to a close.

MIDLAND ASSOCIATION OF GAS MANAGERS.

An Ordinary Meeting of this Association was held at the Midland Hotel, Birmingham, on Thursday last, the 24th inst., under the presidency of Mr. Charles Hunt, and was very numerously attended.

Before commencing the business of the meeting, the members proceeded to the Curzon Hall, where, by the kindness of Mr. Maccabe, and his manager, Mr. J. T. Sutton, the apparatus for producing the electric light (Jablochkoff's system) was open for their inspection. The hall, which is very spacious, is almost entirely lighted up by two electric candles, while four others are distributed at the entrance and in front of the building. The electricity is produced by a Gramme machine driven by a 6-horse power Tangye's engine.

On re-assembling, a discussion upon electric lighting, and its probable effects upon gas enterprise, was opened by the President, and continued by Messrs. J. Annan, J. Darwin, C. E. Jones, R. O. Paterson, G. E. Stevenson, J. Tindall, and others; the conclusion arrived at being that while there is no immeditate cause to fear any serious competition with gas lighting, it behoved all Companies to endeavour, by exercising economy in the manufacture and by extending the use of gas for heating purposes, to strengthen their position with the public.

Mr. G. E. Stevenson next introduced the subject of regenerative furnaces for the heating of retorts, as applied in many parts of the Continent, with special reference to the Leigel form of furnace. His explanations were listened to with considerable interest, and the diagrams and drawings which he exhibited were objects of special attention. It was admitted on all sides that this subject is one of great importance, as bearing upon the question of the economical production of gas.

At the conclusion of the discussion, the election of office bearers for the ensuing year was proceeded with—

Mr. Charles Hunt, was re-elected President.
Mr. P. Simpson, was re-elected Treasurer.
Mr. J. Tindall, was re-elected Honorary Secretary.

Messrs. C. E. Jones and G. E. Stevenson were elected members of the Committee, in place of those retiring, and Messrs. Storer and Cross, auditors.

The usual votes of thanks terminated the proceedings.

WEST OF SCOTLAND GAS MANAGERS ASSOCIATION.

The Thirteenth Half-Yearly Meeting of this Association was held on Thursday, the 26th ult., in the Town Hall, Kilmarnock—Mr. SAMUEL STEWART, Engineer of the Greenock Gas-Works, President of the Association, in the chair. There was a large attendance of members.

Mr. R. S. CARLOW, Secretary of the Association, read the minutes of the previous meeting, from which it appeared that at a meeting of the Committee recently held, a Sub-Committee was appointed to watch the progress of electric lighting, and report to a future meeting of the Association.

On the motion of the PRESIDENT, the minutes were adopted.

FINANCIAL POSITION OF THE ASSOCIATION.

Mr. CARLOW, on the suggestion of the President, then submitted an abstract of the financial position of the Association, from which it appeared that, after paying all accounts, there remained a balance in his hands of £9 8s. 8d., and that at the present moment the benefit-fund amounted to £103 2s. 6d.

The statement was received with applause.

ADMISSION OF NEW MEMBERS.

The PRESIDENT: The next business is the admission of new members, and we have the following gentlemen to propose:—

Extra-ordinary Member.

William Logan, Castlecary Brick-Works, by Cumbernauld.

Ordinary Members.

Frank Scott	Gas Manager, Tillicoultry.
Andrew Scott	Gas-Works, Galashiels.
Robert Miller.	Gas Manager, Innerleithen.
James Black	" Kirk, Fieldbank.
Alexander Winton.	" Grangemouth.
James Hamilton	" Skelmorlie.
Thomas Wilson	" Saltcoats.
Daniel M'Kenzie	Dalmarnock Gas-Works, Glasgow.

On the motion of Mr. M'GILCHRIST (Dumbarton), seconded by Mr. MITCHELL (Coatbridge), the names of the above gentlemen were unanimously added to the list of members.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

In commencing the more important proceedings of this, our half-yearly meeting, it is my first duty to thank you for the honour you have done me in electing me to the position I now occupy as your President; and before entering upon other matters I shall refer for a brief space to the present position of the Association.

Although only established towards the end of the year 1872, we have now 140 ordinary members and 40 extra-ordinary members, showing the Association has had a very vigorous growth so far; and, from the financial statement which has been read to you, it will be seen that financially also the Association is in a very gratifying condition.

This Association was commenced with the object of bringing together the younger members of the profession, and those in charge of the smaller gas-works; but the very great attention that is shown to the proceedings of this Association, by the members of the more important ones connected with the manufacture of gas in all parts of the United Kingdom, is sufficient to show us that ours holds no secondary position.

The very important character of the papers that are from time to time read and discussed at our meetings, and the valuable inventions which several of our members have brought before gas manufacturers—inventions relating to every department of the manufacture and distribution of gas—could not do otherwise than create an interest in our proceedings, and it will be seen, from the papers which will be brought before us to-day, the members are determined to keep up the character of the Association.

At the same time, I have to regret that there is always considerable difficulty found in getting papers, and I would earnestly call upon all present, whose opportunities will allow of it, to contribute, by papers giving the result of their experience or studies, so as to keep up the importance of the Association.

It is also necessary that all should freely enter into the discussion of the papers brought before us. To-day we will have read, for our information and discussion, valuable papers prepared by Messrs. Young, Aitken, Fairweather, and other friends, all of which are of great value; so that although the number of papers to be read is not great, still the smallness of their number will be amply made up for by their excellence, all giving information which will possibly have an important bearing on the future of gas making.

It is not usual, I notice, from the reports of your previous meetings, for the Chairman to extend his remarks to any great length at the first of the half-yearly meetings in each year, and I will, therefore, endeavour to make my remarks as brief as possible. The subject that deserves our most serious consideration, and one that is receiving very considerable attention among scientific men, is that of lighting by electricity. From the reports that appear from time to time, it will be observed that experiments have been made in the lighting, by this means, of open spaces, such as squares, wide streets, and large workshops; and, although these experiments have been attended with more or less success, still the electric light is found very far from being either reliable or agreeable. The apparatus used in producing the light is liable to get suddenly out of order, causing total darkness at any moment, and the light is found to be so intense as to be both inconvenient and dangerous from the intense glare when looking at it, and from the very strong shadows that are thrown. Endeavours are being made to overcome these deficiencies, and various means are being adopted for tempering or softening the light; and, on looking at the rapid strides scientific research is now making, there is little doubt that, so far as lighting large spaces is concerned, these efforts to make the light available will have a certain measure of success. But, so far as the matter has yet gone, the expense of producing the light is so great that its use can only be indulged in when cost is not of such great moment as that a strong light may be obtained.

No attempt, or at least no success, has as yet attended any attempt to make the electric light available for domestic purposes, and, at present, there seems little chance of the light being used in dwelling-houses. Indeed, the whole subject is, for all practical purposes of daily use, in a very crude form; and it is likely to be some years before it can be brought to that state of reliability, or be produced so cheaply as to enable it to compete with gas in the general lighting of towns. Still, we have seen too many wonderful discoveries of late years to doubt of its ultimate success some time or other, and it becomes us, not only as a scientific Association, but as one especially devoted to the subject of the public lighting of towns, to give the matter our most serious consideration and study.

We have to look to the electric light as one that will eventually compete with gas light. Gas has, hitherto, outstripped all competitors, whether oil, paraffin, or wax or other candles—all these methods of lighting, when cost, convenience, and general utility are taken into account, have had to give way to lighting by gas; and it will now become us to devote our attention more than ever to all the various details in the manufacture of gas and the perfection of its distribution, so that every point may be taken advantage of, both to cheapen the first cost of manufacture, and to ensure its delivery to the customers with as little loss or waste as possible, and also not only to so improve the quality, as far as purity is concerned, but also so to improve the methods of consuming gas, as to enable it not only to be burned with as little waste of light as is possible, but also with economy.

The lighting of streets and squares is not usually one of great profit to gas companies, so that competition there is of less moment than the lighting of houses; still, it is a department of public lighting that we would be unwilling, as a rule, to lose, although there are cases where gas companies would willingly get rid of it, as it is often a cause of dispute between gas companies and corporations. And in the cases of corporations who make their own gas, it will be a long time before they find it possible to light their streets so cheaply or so simply, by any other means, as by that of gas light; for, as a question of cost, it must be borne in mind that, although as a matter of accounting, they may charge themselves for gas in public lamps at the same price as they charge consumers, still, as the profits go into the pockets of the public—either directly, as profits, or by selling gas at a cheaper rate than would be the case if they charged themselves with the net cost of the gas—it is practically the same as if they only charged street-lamps at prime cost.

To advise that all possible economy be exercised in first cost of producing gas, and saving of waste in its distribution, is a simple matter, but how it is to be done is quite another thing; for I may assert, without fear of contradiction, that there is no member of this Association who does not do all in his power that can be done, either by hard work or mental anxiety, to make the gas he has to supply as cheaply, and distribute it with as little waste, as possible, under the various circumstances with which he has to contend. It is not, however, only by direct hard work or anxiety that economy is to be effected, or the first cost of production is to be cheapened, but by mutual intercourse of opinion and relation of experience given in discussion, and by adopting the various improvements brought out from time to time. It is seldom that any improvement is brought out that effects a great direct money saving, but a small saving in one department and a small saving in another, effected throughout the whole details of gas supply, put together, in the end permit of a considerable saving in the annual working being shown.

My impression is that one of the most likely directions for us to look for increased profit is by endeavouring to increase the returns from residual products; for in all works there is room for improvement, and in many works a great deal of room for improvement, in this respect. To refer shortly to one item of these—viz., the coke. Unfortunately, from the low value of this with us, any saving that may be effected in setting retorts, or economy of heat in the use of fuel, will not give results of great value; but it is worthy of consideration where circumstances will admit of it, to endeavour to ascertain by direct experiment if it would not effect a money saving to entirely alter our present system of heating retorts, and endeavour to do so by regenerator furnaces; at present, large quantities of heat pass unappropriated to the chimney, which, if utilized, would effect a saving of fuel. There is no novelty in the use of these furnaces, as they are employed on the Continent for heating retorts, and in this country in the manufacture of iron and other purposes.

Unfortunately, in the majority of works in charge of the members of this Association, circumstances will not admit of the present system being altered; still, a saving of heat would be effected by so constructing the ovens as to retain the heat within themselves, instead of it passing off through the retort-house, to the discomfort of those employed there. But in the most important matter of the carbonizing of coal there is ample room for study, and the question is, whether we are taking the best means, from an economical point of view, of distilling coal, by endeavouring to produce the whole of the illuminating constituents in the coal by a single process; and I think it will be allowed, from the information laid before us as the result of ample experiment and study, that the best results, even with the most careful selection of mixtures of cannel, cannot be produced by a simple distillation of the coal. We know that by working with high heats and prolonged charges, or by passing the gas, as it leaves the charge, over highly-heated surfaces, that comparatively large yields of gas can be produced; but, at the same time, from the large quantities of non-illuminating gas produced, the average illuminating power of the whole charge is low, and the high quality of gas we have to supply can only be obtained by the use of a large proportion of rich and expensive cannels. While, on the other hand, by working at short charges and moderate heats, and afterwards subjecting the tar and fluid hydrocarbons to a second distillation at a low heat, permanent gases of a high quality can be produced from inferior and cheap cannels, and much more economically than by the present method with the use of rich cannels.

The difficulties that present themselves to most minds, in adopting this process, is the fear that, in consequence of the naphtha being removed from the tars, it will affect their sale; but I think that there need be no fear of this, for although they may be of less value to tar distillers, yet there are other buyers who will readily purchase them. Those gas managers who work up their residuals find no difficulty in disposing of the tar after the naphtha is removed.

There is another department of the process that I think does not receive in this country that amount of attention it should—viz., the scrubbing department. In many works, scrubbers are not used at all, and in others they are employed in a most inefficient manner. The difficulty, of course, is the want of steam power; but if gas managers were fully alive to the serious loss they suffer from the want of efficient scrubbing power, there is no doubt means would be found for effecting an improvement in the department of purification. There is no difficulty in arranging a scrubber that will work at a very moderate pressure without the aid of machinery, either to give a constant flow of water or for the purpose of spreading the water—a vessel something after the form of the washer now in use; but, instead of the gas going into the box in bulk, causing a large pressure, if it were allowed to enter by a number of small apertures, so as to enable the pressure to be reduced to a minimum, not only would the ammonia be more efficiently removed, and a saving in cost of purification effected, but the quantity of gas liquor produced would be largely increased. I lately saw, at the Lanark Gas-Works, an arrangement that fully effected this purpose.

The whole question of purification is now receiving considerable attention, and the possibility of removing the whole of the impurities in closed vessels is quite within the bounds of probability, and it is not necessary to point out to members of this Association how very worthy this important question is of their very closest study. The saving of purifying material, labour, and convenience, with the avoiding of the nuisance which, by the present system of purifying, is incidental to gas-works, is a sufficient argument in favour of a change such as is looked for.

One very important point for consideration in endeavouring to improve the present system is to effect the purification of the gas, so that the impurities may be removed in a saleable form. All the impurities removed from the gas, with the exception of ammonia, are at present a waste in Scotch gas-works; and when it is considered how valuable these impurities are to other manufacturers, it is evident that we have not yet arrived at the proper mode of turning all our impurities to account. It

behoves us, therefore, to use every effort in our power to discover some practicable means whereby this could be done.

In closing these remarks, I would simply call the attention of the members present to the various articles exhibited, relating both to distribution and consumption of gas. The gentlemen exhibiting are present, and will, I am sure, be glad to give any information or explanation that may be wished. And, in case it may be overlooked, I must at this time ask you to express the cordial thanks of the meeting to those gentlemen for the trouble and expense they have put themselves to, in assisting to make this meeting a success.

The subsequent proceedings at this meeting will be reported in next issue.

SOCIAL SCIENCE CONGRESS.

Address of Mr. W. H. Michael, Q.C., in Opening the Proceedings of the Health Department.

The Meeting of the Social Science Congress was commenced last Wednesday at Cheltenham, and on Saturday Mr. W. H. Michael, Q.C., delivered the Inaugural Address in the Health Department. After referring at some length to the progress made during the present century in regard to curative medicine, which he asserted had fairly taken its place as one among the sciences, he continued:

It is endeavoured to be proved by statistics that the rate of mortality of the people has not decreased since the time when great public works of town improvement, of sewerage, and of water supply have been commenced and executed; while, rather inconsistently, the same persons allege that the increase in the number of the population threatens entirely to overwhelm our empire, and to produce the most disastrous results. Your most distinguished townsman, the late Dr. Rumsey, whose unwearied labours in the public weal, and whose eminent services in the cause of sanitary progress, and constant endeavours to promote the welfare of the people, has ensured for them a national recognition, has said in his book on some fallacies of statistics, "that indiscriminate appeals so often made to the rates of mortality threaten to become a public nuisance." There can be no doubt that figures require much care in their application, and it has been said with justice that they may be made to prove anything, and I certainly do not intend to weary you by reciting long tables of statistics or pages of returns which it would be impossible to follow when read in a public address, and which, to be rightly appreciated, require annotations and explanations at every step. It will suffice to quote to you one extract from the Ninth Report of the Medical Officer of the Privy Council, from which it will be seen what have been the results of sanitary works executed in the towns named:—

—	Population in 1861.	Average Mortality per 1000 before Construction of Works.	Average Mortality since Completion of Works.	Saving of Life per Cent.	Reduction of Typhoid Fever, Rate per Cent.	Reduction in Rate of Phthisis per Cent.
Banbury. .	10,238	23·4	20·5	12½	48	41
Cardiff . .	32,954	33·2	22·6	32	40	17
Croydon . .	30,229	23·7	18·6	22	63	17
Dover. . .	23,108	22·6	20·9	7	36	20
Ely . . .	7,847	23·9	20·5	14	56	47
Leicester. .	68,056	26·4	25·2	4½	48	32
Macclesfield	27,475	29·8	23·7	20	48	31
Merthyr . .	52,778	33·2	26·2	18	60	11
Newport . .	24,756	31·8	21·6	32	36	32
Rugby . .	7,819	19·1	18·6	2½	10	43
Salisbury .	9,030	27·5	21·9	20	75	49
Warwick. .	10,570	22·7	21·0	7½	52	19

This table cannot be too carefully studied. It may be called typical, and shows clearly, by the great reduction of mortality in some places, where the antecedent mortality was greatest, how much and how little may be done or expected by sanitary works, and how closely, circumstances being the same, the same improvement in other districts may surely be reckoned on after judicious expenditure in permanent works.

To take the rate of mortality over the whole of England and Wales for any period, and to compare it with any other period, it is not sufficient to consider the mere number of the ratio of deaths to population. This is most misleading, and the only sure test is to take, with all the difficulties attendant upon it, the census of various periods as guides to help us in our estimate of the public health. It is strange that if sanitary works have been, in this view, of no utility in diminishing mortality, that the period of continued increase of the population should date from the time when they were, for the first time in the history of this country, really commenced to be executed in a scientific manner—when for the first time the houses of the people began to receive attention, and when for the first time fresh and pure water was brought within the reach of the working population of our country. Taking calculations based, it is acknowledged, on imperfect data, we find that in the middle of the seventeenth century the population of England and Wales was something less than 5½ millions, a whole century having added only half a million to the numbers of the people; the next century probably added a million, and in 1801, the date of the first census, their numbers were ascertained to be 8,892,536, or an increase of very nearly 2½ millions in 50 years. But during the present century the increase has amounted to an annual per centage of nearly 1·35, and although during the last 35 years this per centage has diminished, the total number of the population may now be estimated at nearly 25 millions, it being 24,244,010 at the census of 1871. But by what appears to be a strange inconsistency in the argument, a distinguished statist, speaking from the position I have the honour to-day to occupy, looks with the gravest apprehension on the present rate of increase of the people of England, and fears, if he does not predict, the direst results to our commercial supremacy from this cause. He says that, at the present rate of increase, at the end of the fifth generation the population of England and Wales would amount, at the least, to 400 millions, and at the end of the seventh generation to more than the world now contains, and at the end of the twentieth generation to more than 15 such worlds would contain, each as densely populated as our world is at present. He further says that we rejoice fatuously in singing psans in praise of the increasing strength and prosperity of the nation—which must inevitably produce its own destruction; and, as a cure, recommends the wise application of Malthusian remedies to prevent an otherwise inevitable downfall. How happy it is for the well-being of the world that, in the ages past, men have been so regardless of the maxims of public health; otherwise, instead of, as now, only one-fifth or one-sixth of the world being occupied, its limits would long ago have been found too strait for the ever-increasing numbers of the men, women, and children who would have found no means of existence, and must inevitably have miserably perished, and thus have kept up the balance of population to area. In this case the foolishness of the foolish has, according to this estimate, been of more value and avail than the wisdom of the wise.

But other eminent writers on sociology have asked: Why, by sanitary means, strive to preserve the lives of the diseased and helpless? — are you not, by so doing, weakening instead of strengthening the people? Are you not providing objects of charity and examples of degeneration rather than pillars of strength and helps to progress? Are you not degrading the race by retaining what is effete and ready to perish? Should we not in every way be the better when allowing the natural law of selection to act without interference, rejecting the least fit for the struggles of life and death, and keeping the robust and the active to afford their help to the general community? I have elsewhere endeavoured to demonstrate the falsity of this objection, and to show that it proceeds upon an entire misapprehension of sanitary effort. It is quite true that the saving of human life is one of its effects; but it is only one consequence. It is not the sum of its efforts. "The strength of a people does not depend on the absolute number of its population, but on the relative number of those who are of the age and strength for labour."

As, in nature, chemical decomposition is ever warring against vital action, so under present conditions there are causes of disease present amongst us, around us, and often within us, which, assailing and seeking a weak point in our armour of defence, can only be withstood while we can maintain such resistance as is more powerful than the attack. It is the very young or the very aged, the intemperate, those exhausted by toil or by mental effort, who give way. Disease always begins where resistance ends, and those are the most incapable of resistance whose vital force is from any cause weakened or destroyed. Were it not so, the causes which produce disease in one member of a household would be equally potent to overcome all, and all would suffer. That there are favouring conditions in some persons more than in others to attacks of epidemic disease is seen in the different ways in which the poison, whatever it may be, of eruptive fevers, attacks various members of a family, several passing through the ordeal of an attack of scarlet fever or measles with comparatively little disturbance of the general health, or altogether escaping attack, while the intensity of the poison seems concentrated on one individual, upon whom in a few hours it proves fatal. The whole object of sanitary regulation is so to increase the resistile power as to encase the body in that which shall be proof against attack. To supply this, we try to provide those great essentials of strength, pure air and water. If, under ordinary circumstances, resistile power be numbered as being possessed by individuals in what I may call arithmetical progression, and one person may be registered as having 10 degrees of such power, another 9, 8, 7, and so on to 3, 2, and 1; and if, in the same way, we say that, under ordinary circumstances, all persons having less than 5 degrees of power to resist disease will die before attaining 21 years of age, then, further, it may be said that if all our population were classed under these divisions in equal numbers, one-half of those born would only survive the indicated period. If, then, our whole efforts were directed to save these 5-10ths of the population, the objections I have noted as to weakening the strength of the people by retaining the worst part with the best might be well founded; but this is an entire misapprehension. Sanitary effort affects the comparatively strong equally with the comparatively weak; it makes that stronger which was already strong, and takes away some of the weakness from those heretofore weak. It adds to all what, for purposes of illustration, may be called one degree of resistile power; hence the previous possessor of ten degrees under better sanitary conditions acquires a force of eleven; and so on through the whole scale. The man or woman who, with five degrees of health, would have been unable to cope with an attack of a preventible disease, has now, registering six degrees, sufficient power to avoid the attack. Hence one, out of the five who would otherwise have succumbed, is saved, and every one is marked one degree higher on the dial of health, strength, and longevity.

Every effort to provide better house accommodation, to sewer dwellings, to bring fresh air to a community, and copious supplies of pure water, places a mark on a community which you may read as though plainly stamped on their countenances. Better, taller, and stronger forms, brighter faces, clearer complexions are the tokens of this change. The practised sanitarian, on entering any town, whether at home or anywhere on the Continent of Europe, could at once, by scanning the countenances and marking the stature of the people he met with in the public streets, accurately gauge the sanitary condition of their houses and their streets. It is also notorious that in every community the death-rate, and therefore the sickness-rate (although, about this, we know much less than we ought, owing to there being, as yet, no attempt to secure registration of sickness) varies in every town according to the attention paid to sanitary requirements; and any one who will carefully study the localities of deaths in any town of considerable size, would be able to map out at least three zones in which the mortality would be somewhere in the proportion of one, two, three. That is, where the rich live, and where every sanitary requirement is provided, there will be only one death to every two in parts in which less perfect attention has been paid to the means necessary to secure perfect health, while in quarters of the town inhabited by the working classes, densely crowded together in their habitations, without proper water supply and other accommodation, three times the number of deaths are recorded.

But with all this the question recurs: To what is the great increase in our population in the present century to be attributed? Is it to immigration from other countries, attracted by our great prosperity, by persons wishing to share with us in our goods? Against these arrivals of foreigners, however numerous amongst us, we may set off what we have done in colonizing from our midst a fifth quarter of the globe. And now we have increased, and are increasing, at such a rate as, in the opinion of those we have quoted, threatens our prosperity. Are we, with our increased numbers, weaker, less manful, more prone to disease, less able to make our way against a world in arms? This has never been alleged—it is too opposed to fact; but all that threatens us is our greatest boast—namely, our insular position and confined area, which makes us dependent on other countries for much of our food, and the fear lest, our maritime superiority not being maintained, we shall perish with hunger. I leave to other and more skilful writers, who are thoroughly competent, to dissipate any fears as to this view of the probable decadence of our country's greatness.

Following in the wake of curative medicine, and as almost a necessary condition of its progress, and of the increased knowledge obtained of the causation and communication of diseases, preventive medicine half a century ago started into new life and vigour. Public attention became directed, by earnest workers in the public weal, to the necessity for action, and many communities obtained special Acts of Parliament for town improvements. Experience began to be acquired of what was necessary, and, in 1847, Acts were passed consolidating, in the Town, Police, and Improvement Clauses Acts, those provisions which had been found to be most generally essential to proper provision for the wants of the people. At this time commenced that beneficial legislation which, although still imperfect, has gone on improving up to the present year, in order to meet the exigencies of our position. Up to, and even after, the date to which I have alluded as the commencement of more general improvement, houses were built back to back, without the slightest attempt at ventilation. Blind alleys and stifling courts existed at every turn, and there children dabbled in the foul mud of their unpaved surfaces. There

was no subsoil drainage—a privy with a cesspool was a common appendage to a dwelling-house, if of sufficient rental value. In numberless instances, even this convenience was wanting, and the surface of the streets became the receptacle of every kind of ordure; and when cesspools became full, and it was necessary to get rid of accumulated fœcal matter, either they were emptied in what I may, to borrow the significance of a word from the French language, call a brutal manner, or cesspits were dug in any piece of ground attached to the house, and the contents of the cesspool either turned or thrown in, and the surface replaced. Wells for drinking water were, in almost every case, close to these abominations. These were highly valued in proportion to their noxious qualities, for they produced cold, brilliant, sparkling, but highly poisonous water.

Engaged some time ago in a Government inquiry, I inspected the water supply of the district; and, in the course of my domiciliary visits, called at a beer-house to ask as to what water they obtained. For use in their trade they were content with the well in their own back yard, but for themselves they paid a messenger to fetch water from a well at some little distance, which, when seen, was found to be closely surrounded by pigstyes, cesspools, and stables, with heaps of manure close to its mouth, producing exquisitely cool and bright water, but loaded with animal matter at any moment likely to become deadly in its effects.

The condition of our towns and cities of to-day cannot be compared with that of 30 years ago. We have systems of sewerage, subsoil drainage, expensive water supplies, effective lighting, all refuse is quickly removed from our streets and houses, streets are widened, almost all are thoroughfares, and densely-crowded districts are thrown open to the influence of light and air. But much remains to be done.

A great portion of the sanitary legislation of the past 30 years was permissive. This part was an entire failure; while it must not be forgotten, on the other hand, that, to succeed in its objects, compulsory legislation requires to be applied with the greatest care and the most delicate hand—that it may not create greater evils than those which it seeks to remove. No legislation, especially that which has to deal with the home life of the English people, can hope to accomplish its objects if it be far in advance of their convictions. It is hard to persuade an ignorant man that he may not do as he likes with his own; and there is a fixed idea that the law recognizes as a fact that an Englishman's house is his castle, not to be entered, or in any way interfered with. Laws which, with adequate sanctions, are intended fully to protect life and property, give rude blows to these ideas, and are eminently distasteful to those who wish to be content with old forms and old habits. It is difficult to receive as truth that the dearest possession of a man—his life—is the property of the State, and although no means of punishment have been devised which can reach the suicide, yet the law rightly punishes the person who is unsuccessful in the attempt upon his own life. For every man in the community, as a unit making up its strength, belongs to it, and he must so use himself and his possessions as in the use not to injure others.

It is to carry out this idea of the functions of the law that we have Nuisances Removal and Diseases Prevention Acts. Among the most fatal and distressing of diseases, the exact nature of which science has not yet determined, is diphtheria. There never was a case of this disease (unless communicated directly from person to person) the cause of which could not be traced to foul drains or ditches. The law insists, then, and most properly, that the owner of land upon which such engines of destruction exist, shall not endanger the life of himself, his family, or his neighbours, by allowing their continuance; it enforces their removal, and, in default, itself enters upon the property, and does the necessary work.

The Public Health Act punishes the exposure of persons suffering from infectious disease. A young girl, a domestic servant, in the West Kent sanitary district, a few months ago returned home ill from her situation. The next day she had developed small-pox. Putting a veil over her face, she proceeded in an omnibus to the Small-pox Hospital at Hampstead. A young girl who sat next to her in the omnibus at once took the infection, went home, sickened, and died. Does not the law rightly punish so wanton a crime? and who can predicate the resulting effects of one such exposure? And yet there are those who murmur and condemn the law which applies measures of prevention to stamp out disease. To defend such acts is to say that, because the greater number will escape injury, there can be no harm to discharge firearms, or to throw a live shell into the midst of a teeming crowd of people.

So the law closes wells which are proved to be polluted, and prohibits the use of dwellings unfit for human habitation, and prevents overcrowding in dwellings, inspects common lodging-houses, and regulates their use, and prohibits the doing of, or leaving undone, any act which, resulting in a nuisance, would tend to injure the public health; it inspects food and drugs, and prevents their adulteration, and does numberless other acts which are protective to life. But the law has gone much farther than this in enacting provisions for compulsory vaccination. In all the cases to which I have referred, if the law provides punishment, it is because, in relation to property, there is an act done, or left undone, clearly tending to the injury of the State. Here the law says: You shall do something to the person of your child to prevent injury to itself or to others; and it punishes neglect by fine or imprisonment. To be entirely logical, the State should, upon default, vaccinate the child by its officers; but public opinion would not support this, and it is only through the steady conviction in the public mind that a child unvaccinated is a standing menace to the community that this excessive interference with personal liberty—the greatest which I know of in the course of our jurisprudence—could be maintained and supported.

This true secret, as it would appear, of the great improvement in our sanitary condition is the providing of purer air than heretofore in our dwellings. Pure water is a necessary of life, which cannot be neglected without entailing disease and death, but it sinks into absolute insignificance as compared with air. By drinking water into which the germs of disease, if there be such—for they have never yet been demonstrated—or, to speak more plainly, water into which the alvine discharges of persons suffering from typhoid fever, cholera, and the like diseases, have found their way, we undoubtedly may, and often do, produce disease; but all this is as nothing compared with the steady detriment to health and strength by breathing, that is drinking in, impure air. Some persons never drink any water; many only drink it in beer; others when it has been boiled for tea or coffee, or the like drinks; and a very small quantity would form the sum total of every person's daily consumption as drink. But we drink in air at every instant; twenty times a minute we are taking in, and bringing the draught into the most intimate relation with our most vital organs, and the smallest intermission in the supply, from any obstacle to its entrance into our lungs, is fatal. What a miraculous process going on night and day, without an instant's cessation, and capable of being continued for more than a hundred years without any wear or tear of the organs of transmission! It is said that in London, the healthiest city in the world, the only really healthy person is the butcher boy, with uncovered head, and well-oiled locks floating about in the breeze, as he, astride on his pony, rushes through the streets. And yet this atmosphere is a mass of impurity. Every person pours out each day no less than half a pound of carbon into the air we breathe, and what we expire is incapable of supporting combustion, and, therefore, as a sure rule, incapable of supporting life. And what other mixtures are there in our great city polluting the air? Smoke and vapour and all kinds of vegetable spores, and animal germs! for wherever we go and test the air, on our clothes, our furniture, our walls, everywhere are to be found evidences of animal pollution, and nowhere can we test air free from the presence of ammonia, the products of decomposition. Refuse of every description is disclosed to us by transmitting through the atmosphere of the rooms we inhabit the electric ray, and yet so grand is the vital power that, when admitted into our lungs, it chooses the good and discards the evil.

But to revert to our butcher boy. It may be said, if the atmosphere be so bad, then he who has the least of it is the best off, and your interesting example should be of all others the least healthy. But all this pollution of the air is happily avoided by the grand law of diffusion of gases, which is always in action, bringing down for our use a purer supply from the great reservoir of pure air above. It is stagnant air that is so dangerous, air out of which, by the processes of life akin to combustion, we have burnt out the vital principle. It is what we have taken away more than what we supply, although that is eminently poisonous, that gives to the breathed air its deadly character.

To see this in its intensity, we should study the condition of the peasantry of Switzerland and of the valleys of North Italy, and see how, on the women and children, the vitiated air in which, owing to the construction of their dwellings, they for many months live, produces its disastrous effects. I passed in the streets of Marseilles, a few weeks ago, a man whose face disclosed the tale of his life. Its yellow anemic colour told the practised eye of years of work in dark and hot mines of great depths, where imperfect ventilation and absence of light produces entire etiolation. I have seen the blood a tawny yellow in those suffering from the diseases incident to such mining employment.

If you wish to demonstrate to yourselves the enormous influence on life of fresh air, whether it be on animal or vegetable life—and the relations of the two are most intimate—take a plant of some semi-hardy fern from your greenhouse, place it on the table in the full light, and where, from the open window, it may be daily reached by currents of air, and at the same time place another similar fern a yard away, out of the direct light, and in the still air of the room you inhabit. In a few weeks, while the one exposed will be fresh, green, and in full vigour, the sheltered one will be brown, withered, and, if not dead, hopelessly enervated. This is what, in a less degree, happens to every one who is poisoned, or poisons himself or herself, away from constant change of the air breathed. It is this which insidiously preys upon health, and which formerly was amongst ourselves, and now constantly is among other nations, the cause of deadly attacks of plague, typhus fever, and the like.

It is but right that the law, by its strong arm of power, should prevent the mixing of noxious vapours in the air—should prohibit the establishment, amongst populations, of trades from which emanate offensive and disgusting vapours; but the injury done by all these is not worth the mention beside the poison we create for each other where the atmosphere we breathe is not surely and constantly renewed. Those persons who spend eight to ten hours of each day in their sleeping apartments, with doors and windows closed, and no draughts allowed to enter by the chimney attached to the fire-place, are engaged in a work of self-poisoning, and are slowly but surely undermining their vital force and power, and when exposed to infection will be found unable to resist the advent of disease.

These are elementary truths, and if we are really earnest and anxious in our professed object, the promotion of social science, we shall use every opportunity to urge them on the attention and to ensure their adoption by all alike, for to all they are matters of life and death. The rich, who have spent large sums in extensive works of drainage and water supply to their mansions, require as much as the poor to learn for themselves upon what their safety depends.

I was lately a visitor at a palatial hotel, standing in its own extensive and beautiful grounds, and claiming to be a health resort for those whose business avocations, when in need of relaxation and change of air and scene, keep them of necessity close to town. The manager assured an anxious inquirer who, with his family, was about to take up his residence there for some weeks, that the drainage was perfect, and that complete ventilation of the sewers existed, by special pipes conveying any foul gas generated within them to the top of the house. Upon walking through the corridors of the house, one became sensible of an indefinable faint, close feeling—it could hardly be called a smell—which indicated that there was some defect in the ventilation, not causing the air to be changed sufficiently often. Upon entering any of the retiring-rooms, and lifting the handle of the lever which discharged the contents of the pan of the closet, a puff of sewer gas was at once distinctly perceptible.

And this is the condition of a vast number of the best houses in our Metropolis, in cities and in towns, and in hotels at sea-side places, upon which large sums of money have been expended to perfect their sanitary condition. There is no security that any such should not have typhoid fever in their midst, unless all direct communication with main sewers is avoided. Water carriage of sewage is the greatest sanitary boon ever conferred on a community, and if sewers were always properly constructed and laid, if they never became sewers of deposit, if their contents were rapidly discharged, if they were always ventilated, and if the contained sewage were, within four hours from its entering the sewer, conveyed to land, and there oxidized, and its noxious powers destroyed by being brought into connection with the oxygen of the air, as found in the pores of earth—whatever process be adopted, whether chemical, mechanical, or vital, or a combination of the whole, with all these "ifs" always perfect—then our care might not be required; but if we would prevent our houses from being fever-traps through our own sanitary works, if we would not have our costly works of safety become the means of our own destruction, we must effectually cut off all connection between our houses and main sewers, and prevent the possibility of the products of decomposition and putrefaction of the contents of these sewers from entering our dwellings.

It is here that disinfectants, so called, are worse than useless. By masking, they intensify our danger. I well remember when sulphurous acid gas was vaunted as the sure preventive of cholera; but my belief in the use of such preventives of disease received its *coup de grâce* in one of the epidemics of cholera, specially virulent in some parts of South Wales, when a row of houses close to the smelting furnaces of one of the great copper-works of the district was most severely visited, every house having its victims, while, owing to the direction of the wind during the whole period, these premises were enveloped in a dense cloud of sulphurous acid gas.

Nothing is so dangerous as to assume in these matters knowledge we do not possess. We must earnestly work and inquire, and be prepared to give up, as occasion and truth may demand, our most pet theories. We know, at present, nothing of the absolute cause of typhoid fever, diphtheria, or cholera—it may be by germs, or it may not; but we have the most valuable practical information, by the use of which we may avoid the incidence and spread of these diseases. We can isolate scarlet

fever and small-pox, and absolutely prevent their spread. We can assure the friends of those suffering from typhoid fever that there is no danger to them in their attention to the sick; and at every turn we have acquired knowledge tending to improve the general health.

This knowledge, often sneered at as that of specialists, doctrinaires, and the like, has affected public opinion, and led to the adoption of laws by the Legislature, and the execution of works by public authorities, which have changed our lives, improved the status and appearance of the people, and which, still in progress, are daily conferring blessings on hundreds of thousands of our toiling countrymen. But we are still far from perfection, and I wish shortly to point out how, in my opinion, further changes in our sanitary laws may beneficially influence the future of our country.

(*To be continued.*)

BRITISH GASLIGHT COMPANY, LIMITED.

The following is the Annual Statement of Accounts, showing the actual state and condition of the Staffordshire Potteries Station of this Company, for the year ending the 30th of June last:—

Dr.—*Revenue Account.*

To Coals		£10,959	3 3
Wages		4,034	9 0
Purifying material and process		867	17 3
Repairs and maintenance of meters, mains, service-pipes, fittings, and other works		1,799	5 1
Lamps (providing, lighting, extinguishing, cleaning and repairing)		542	18 5
Rates and taxes		1,161	16 6
Salaries, Collector's commission, and payments to Directors and Auditors		1,711	6 8
Professional charges and incidental expenses		927	17 1
Reconstruction of retort-beds		262	18 6
2 per cent. on cost of works for depreciation		1,282	0 0
Dividends, to which Proprietors are entitled under the British Gaslight Company, Limited (Staffordshire Potteries) Act, 1858, viz.:—			
10 per cent. on £42,610 (half year to Dec. 31, 1877)	£2,130 10 0		
7½ per cent. on £24,850 6s. 3d. (half year to Dec. 31, 1877)	931 17 8		
10 per cent. on £42,610 (half year to June 30, 1878)	2,130 10 0		
7½ per cent. on £26,130 0s. 10d. (half year to June 30, 1878)	981 2 3		
	£6 173 19 11		
Deficiency of dividends to June 30, 1877	10,735 19 7		
	£16,909 19 6		
Less dividends realized for the year ending June 30, 1878, carried out	5,506 7 2		
		5,506	7 2
Total deficiency of dividends to date	£11,403 12 4		
		£29,075	18 11

Cr.—*Revenue Account.*

By Sale of gas, after deducting £151 15s. 7d. (estimated discounts and bad debts)		£24,624	19 5
Coke, breeze, tar, and other residuals and fittings		3,604	12 2
Sulphate of ammonia		846	7 4
		£29,075	18 11

Dr.—*Balance-Sheet.*

To Capital expended previous to Act 21 & 22 Vict., cap. 33		£42,610	0 0
Additional capital expended since Act 21 & 22 Vict., cap. 33		26,163	0 10
Amount owing by the Company		2,659	8 7
Balance		9,564	9 2
		£80,996	18 7

Cr.—*Balance-Sheet.*

By Cost of works	£58,743 6 3		
Deduct for depreciation	1,282 0 0		
	£57,461 6 3		
Add extensions made during the year	11,311 14 7		
		£68,773	0 10
Amount owing to the Company for gas, coke, residual products, fittings, &c. (exclusive of estimated bad debts)		6,064	1 9
Fittings on hire		362	6 8
Coals in stock		823	0 5
Residual products and other stocks		374	7 3
Cash at bankers		2,196	9 4
Petty cash		2	14 10
Insurance account, invested in Consols		314	17 5
Hanley Corporation Gas Bill—amount of costs incurred in defending the Company's interest against this Bill		2,086	0 1
		£80,996	18 7

SALES OF GAS AND WATER SHARES.

At the Auction Mart, Tokenhouse Yard, on Wednesday last, Messrs. Edwin Fox, Bousfield, and Co., offered for sale by auction the following gas and water shares:—Seventy fully-paid £10 shares in the Wimbledon and Mitcham Gas Company, bearing an annual dividend of 10 per cent.; ninety old shares of £10 each, fully paid up, thirty new £10 shares, fully paid, all bearing a dividend of 10 per cent., and thirty-two new £10 shares on which £3 had been paid, bearing a dividend of 7 per cent., in the Hornsey Gas Company (disposed of by order of executors); also two-fifths and a fractional part of a freehold share in a King's moiety, one-eighth of a freehold share in the Adventurers moiety, and fifty £100 new shares in the New River Company. The dividend on the freehold shares was at the rate of about £2200, and the new shares £10 3s. 7d. per cent. for the year ending Midsummer last. The speciality of the New River Company is that their original shares are freehold or real estate, and pass by deed. Each freehold share represents an undivided seventy-second part of the entire undertaking, one-half being called the King's moiety and the other half the Adventurers moiety and entitles its holder to parliamentary voting powers.

The gas shares were put up in lots of five and ten, and the New River shares were divided into sixty-four lots.

The Wimbledon and Mitcham shares were first offered, and the bidding for the first lot (five shares) advanced from £8, at which it started, to £17, when the Auctioneer announced that the shares were not for sale.

The Hornsey Gas Company's shares were then put up in lots of ten, the fully-paid shares realizing £11 each, those on which £3 had been paid being knocked down at £3 5s. and £3 10s. each.

Lot 1 of the New River shares consisted of 1-50th part of a King's moiety, the proportion of dividend payable on which at Midsummer last was £44 14s. 5d., together with voting power and reversion. The lot sold for £1780, this being £100 below the average price usually realized for this property. Lots 2 to 12 were similar to lot 1, and fetched on the average £1771 each. Lot 13 consisted of the 100th part of a King's moiety, the proportion of dividend in respect of which at Midsummer last was £22 7s. 2d., also with voting power and reversion. The lot was sold for £900. Lots 14 to 30 were similar to lot 13, and realized an average price of £877 each. Lot 31 comprised 1-60th of an Adventurers share, the proportion of dividend in respect of which at Midsummer last was £37 5s. 4d., with voting power and reversion. This lot fetched £1510, the average price usually realized being £1660. Lots 32 to 35 were similar, and realized the same price. Lot 36 comprised the 120th part of an Adventurers share, the proportion of dividend in respect of which at Midsummer last was £18 12s. 8d., also with voting power and reversion. This lot fetched £760, the same price being realized for lot 37, which was similar, as were also lots 38 to 40, the bidding for which did not advance beyond £755. Lot 41 was a £100 new share, fully paid up, and bearing an annual dividend, at Midsummer last, of £10 3s. 7d., together with participation in a bonus division, and all the privileges of the original shares. This lot was sold for £335, as was also lot 44. Lots 42 and 43 fetched £340 each, and lot 45, £330. Lots 46 to 48 consisted of two shares each, and realized £650 per lot; lots 49 to 54 (two shares each) £640 per lot. Lots 55 to 61 (three shares each) sold at the rate of from £305 to £315 per share; and lots 62, 63, and 64 realized £310, £310, and £315 respectively per share. Lots 42 to 64 were similar to lot 41—namely, new shares.

The room was densely crowded, and the bidding generally spirited. Considerable disappointment seemed to be felt when the announcement was made of the withdrawal of the shares in the Wimbledon and Mitcham Gas Company.

OPENING OF NEW GAS-WORKS AT STOCKPORT.

Last Thursday the new gas-works for the Stockport Corporation, which have been in course of erection since May, 1876, were formally opened by the Mayor, in the presence of a considerable number of the members of the Town Council.

These new works were rendered necessary in consequence of the great increase in the consumption of gas which took place after the close of the American war—between the years 1864 and 1874 it had nearly doubled. As a result, it was found necessary, about five or six years ago, to increase the making power of the Heaton Lane works, which, with the Millgate works, have up to last week furnished the supply which the town has had. An addition of several beds of 7 retorts was accordingly made, and in the first winter for which they were available two beds of the retorts were called into action, and in the following winter a third; but even this was insufficient to meet the demands on the works, so that it became a question what steps should be taken. The Heaton Lane works were examined, with the view of ascertaining whether they were capable of further extension, and many discussions took place in respect to the proposal. It was found, however, that although the number of retorts might be increased by the erection of an additional retort-house, there was no space for another gasholder, and, without storeage, the extra production which additional retorts would have afforded could not, of course, have been rendered available. Eventually, the Sub-Committee of the General Gas Committee reported that the time had come for new ground to be acquired and entirely new gas-works to be provided. Various sites in the town and vicinity were inspected by the Committee, who were assisted by the Resident Engineer, Mr. Jacques, but all of them were found either to be unfitted for such works or not to be obtained. After negotiations extending over some five or six months, a site of nine acres was obtained, and in February, 1876, the drawings and specifications were prepared, and contracts entered into. Early in May operations were commenced, and, though somewhat delayed in consequence of unfavourable weather, have now been carried to a successful conclusion.

The new works are much larger, and have cost much more, than the first estimate of a works given by Mr. Jacques. The original estimate, however, it should be said, was made without any knowledge of the land which would be available, and for works to produce only 750,000 feet of gas per day. The present buildings and apparatus are designed so as to be easily extended to three times their capacity, without any part being interfered with or disturbed, and thus carbonize 225 tons of cannel and make 2,250,000 cubic feet of gas per 24 hours. It must also be taken into consideration that the cost of the land, and, consequently, the river and enclosing walls, were not, and could not be, comprised within an estimate of works for which the land was not known. Moreover, many important alterations have had to be made from the first plans. For example, the original intention was to place four purifiers in the purifier house, whereas it was afterwards found desirable to make it for six. Again, in order to carry the fumes away, and to create as little nuisance as possible in the locality, the retort-house and ventilators have been considerably raised, and also the chimney, which is now of sufficient size for works of three times the capacity of the present. These items have brought up the expenditure to about £60,000, and in most, if not indeed, every instance, the alterations and deviations from the original estimate have been rendered requisite by the necessity for providing against any future contingencies that may arise.

At the opening ceremony the party were conducted by Mr. Jacques, the Engineer, and Colonel Wilkinson, the Chairman of the Gas Committee, first into the retort-house, where Mr. H. Pearson, the late Vice-chairman of the Committee, lighted the first fire, Mr. H. Heginbotham the second, and Mr. W. Claye, as the representative of the first gas maker in Stockport, the third. Others were lighted by Messrs. Hope, Smith, and Crippleditch, members of the Gas Committee. Mr. J. Leigh set in motion the first engine for hoisting lime by means of buckets on an endless chain, and Alderman Nield started the pumping-engine in the basement. Colonel Wilkinson set in motion the large engine in the exhauster house, and the Mayor turned on the gas into the mains in the governor-house, and in a few well-chosen sentences declared the works open.

After a thorough inspection of the works, the party assembled in one of the rooms, on the walls of which were the plans and sections, prepared by Mr. Jacques, showing all the details of the works. Here success to the works, and the health of the Engineer and Chairman of the Gas Committee, were drunk, and, subsequently, a banquet was held at the George Hotel in honour of the occasion.

We have received a description of the new works, specially compiled by Mr. Jacques, and for this we hope to find space next week.

SOCIETY OF ARTS EXAMINATIONS FOR 1879 IN THE TECHNOLOGY OF ARTS AND MANUFACTURES.

The programme of Examinations for 1879, in connection with the Society of Arts, has just been issued. The examinations in the Technology of Arts and Manufactures include fifteen subjects, viz.:—I. Cotton Manufacture. II. Paper Manufacture. III. Silk Manufacture. IV. Manufacture of Steel, &c. V. Carriage Building. VI. Pottery and Porcelain. VII. Gas Manufacture. VIII. Glass Manufacture. IX. Cloth Manufacture. X. Silk Dyeing. XI. Wool Dyeing. XII. Calico Bleaching, &c. XIII. Alkali Manufacture. XIV. Telegraphy. XV. Photography.

The Society have issued the following directions to those who intend competing:—

In order to pass these examinations, it is essential that the candidate (who must be actually engaged in the special branch of industry in which he desires to be examined) should possess, in the first place, such an

elementary knowledge, at least, of abstract science, as will enable him thoroughly to understand the scientific principles of which his art or manufacture is an application; and, in the second place, such a knowledge of the application of those principles in his trade as will show that he is practically conversant with the various processes and manipulations of the factory or workshop. The theoretical knowledge must not be a mere "cram" of empirical dicta; nor the practical knowledge a mere committal to memory of descriptions of manufactures picked up from text-books.

The examination in each industry may, therefore, be considered in three parts.

The first part includes those branches of science a knowledge of which is requisite as a foundation for sound technical instruction in that particular industry.

The second part relates to the technology of the manufacture, or the special application of the various branches of science to it.

The third part relates to the practical skill in the manufacture itself.

The candidate's knowledge of general science will be tested by the May Examinations of the Science and Art Department. The examination in Technology will be by a special examination paper, to be worked in conjunction with these examinations. The practical skill will be judged by the returns of the candidate's employment for some time past in the particular art or manufacture.

In those branches of industry in which Freehand and Mechanical Drawing, Painting, and Designing for Manufactures are required, the candidate's power will be tested by the Examinations of the Science and Art Department.

On the result of the combined examinations the Society of Arts will award certificates. These certificates will be of three grades, according to the proficiency of the candidate:—

1. The elementary grade.
2. The advanced grade.
3. Honours.

Each grade will further be subdivided into two classes—first and second class. A candidate who has obtained an elementary or advanced certificate may be again examined for one of a higher grade in a future year.

For the particulars and date of the Examinations of the Science and Art Department, the candidate is referred to the "Science Directory and Time-Table," issued by that department. These may be obtained on application to the Secretary, Science and Art Department, South Kensington, London, S.W.

The examination in Technology will be held in 1879, on the evening fixed for Nautical Astronomy, by the Science and Art Department.

Candidates must make their arrangements for examination at the different local centres with the Secretaries of the Local Committees, either those organized in connection with the Society of Arts, or with the Science and Art Department. [A list of these is given in a pamphlet which can be obtained on application to the Secretary of the Society.] The Secretaries of Local Committees willing to hold the examination, and having candidates for examination, should apply, early in the month of March, 1879, to the Secretary of the Society of Arts, Adelphi, London, W.C., stating the number of candidates desirous of being examined, when a corresponding number of forms (A) will be forwarded, to be filled in by the candidates and their employers. These must be returned not later than the 31st of March, after which no forms will be received.

As soon as the results of the Science and Art Examination are published, a number of forms (B), corresponding with that of the candidates who have been examined in Technology, will be forwarded to each centre of examination, and the Local Secretary should see that each candidate fills in a form showing the highest successes he has gained in the Science Examinations, in the subjects in which it is necessary to pass in order to obtain a certificate in Technology. These forms should then be verified by the Local Secretary, and returned to the Society of Arts.

The subjoined has reference to the examinations in the "Gas Manufacture Section:"—

PART I.—*General Science.*

1. *The Elementary Certificate.*—For this certificate the candidate will be required to have passed in the elementary stage of one of the following subjects:—

Subject 1. Practical, Plane, and Solid Geometry, or in Second Grade Geometry (Art).
" 6. Theoretical Mechanics; or in
" 7. Applied Mechanics.
" 10. Inorganic Chemistry.

He may then count marks in any of the other subjects given in paragraph 4.

2. *The Advanced Certificate.*—For this certificate the candidate will be required to obtain at least a first-class in the elementary stage of—

Subject 1. Practical, Plane, and Solid Geometry.
" 2. Machine Construction and Drawing.
" 6. Theoretical Mechanics; or in
" 7. Applied Mechanics.
" 8. Acoustics, Light, and Heat.
" 10. Inorganic Chemistry.

He may then count marks in any of the other subjects given in paragraph 4.

3. *Honours.*—For honours, the candidate must have at least passed in the advanced stage of the subjects given in paragraph 2, as well as in Steam; and, in addition, he must have passed in the elementary stage of Organic Chemistry. He may then count marks in any of the other subjects mentioned in paragraph 4.

4. The following branches of science are more or less involved in the manufacture of gas:—

Subject 1. Practical, Plane, and Solid Geometry.
" 2. Machine Construction and Drawing.
" 3. Building Construction.
" 5. Pure Mathematics.
" 6. Theoretical Mechanics.
" 7. Applied Mechanics.
" 8. Acoustics, Light, and Heat.
" 9. Magnetism and Electricity.
" 10. Inorganic Chemistry.
" 22. Steam.

PART II.—*Technology.*

Examiner.—A. Angus Croll, Esq.

5. The characteristic properties of the various kinds of coal; their capabilities of producing gas having a high illuminating power; the relative value of the residual products.

6. The construction of a retort or oven best adapted for the destructive distillation of coal.

7. The setting and construction of retorts, made of iron or clay, set separately or in combination, and the advantages and disadvantages of the various systems employed, having regard to the fuel consumed, and the wear and tear of the apparatus.

8. The effects of temperature in modifying the quantity and quality of the gas produced.

9. The description of apparatus best adapted for condensing and cooling the gas, so as to get it into the most suitable condition for general purification.

10. The composition and special properties of the various agents employed for the purification of gas.

11. The best construction of gas-meters, having regard to continued correct registration.

12. The principles adopted in the construction, laying, and size of the mains employed for the distribution of gas, having regard to the distance of the source of supply, the various altitudes of the districts to be supplied, the quantity at present required, and the probable future requirements.

13. The pressure to be employed at the works to secure an adequate pressure at the points of consumption, having regard to the interests of both producer and consumer.

14. The simplest method of ascertaining the purity and illuminating power of gas.

15. The various kinds of machinery which may be used in gas-making in lieu of manual labour.

PART III.—*Practical Knowledge.*

16. The candidate must forward to the Society of Arts a certificate, on a form supplied, certified by his employer, stating the nature of his employment in gas-works, and showing that he is practically conversant with at least one branch of the manufacture.

The following prizes are offered by the Society in each of the 15 subjects, to such candidates only as obtain first-class certificates:—

To the best candidate in Honours, £10.
To the best candidate in the Advanced Grade, £7.
To the best candidate in the Elementary Grade, £5.

Any special prizes that may be offered will be announced in the *Journal of the Society of Arts.*

A candidate cannot take a prize of the same grade more than once, and, having taken a prize of any grade, he cannot take one of a lower grade in a subsequent year.

THE ELECTRIC LIGHT.

The following is the report on the electric light, by Lieut.-Col. Haywood, the Engineer and Surveyor to the Commissioners of Sewers of the City of London, referred to in last week's "Circular to Gas Companies:"—

Engineer and Surveyor's Department,
Sewers Office, Guildhall, Oct. 11, 1878.

To the Streets Committee of the Honourable the Commissioners of Sewers of the City of London.

Gentlemen,—I beg to report that, in pursuance of your directions, I have made some inquiries into what has been recently done in the usage of the electric light. These inquiries have been principally made in Paris, where this mode of illumination is more extensively employed than elsewhere.

Although the Commission is mainly concerned in the suitability of this light for public ways, it represents a community immensely interested in obtaining an efficient light for the purposes of trade and commerce. No section of the metropolitan community is, indeed, more interested, for, within the City of London, The Gaslight and Coke Company gathers a rental of £370,000 per annum. I shall, therefore, refer to electric lighting both for public and private purposes; indeed, it is almost impossible to deal with the subject without doing so. I cannot, however, promise to tell the Commission much, if anything, that is new, for, in various reports and papers in scientific and other journals, most of the information has already been made public.

The powerful light obtainable by electricity has long been known, but the flickering and uncertainty of the light were, until lately, so great as to unfit it for general use. Electricians, for many years, tried to obtain from it a steady and continuous flame of uniform intensity, for until that was accomplished it was known that it would be but of little practical value.

This difficulty appears to have been largely overcome by M. Jablochkoff, a Russian electrician, whose patents are now being worked by the Société Générale d'Electricité. The head offices of this Company are at Paris.

It is possible that electricians may differ as to whether the Jablochkoff process (there is more than one process) is the best or not, or whether it is that which is most likely to be further developed with utility. Into these differences I shall not enter, nor into any technical descriptions; but as the Jablochkoff system is more in use than any other, and as it is the only system of electric lighting upon a considerable scale that I have cognizance of, this report will mainly deal with what is being done under that system.

For the production of the electric light under the Jablochkoff patents, the following apparatus is employed:—A steam-engine, or other motive power—a dynamo-electric machine, invented by a M. Gramme, and usually spoken of as a "Gramme;" copper-wire cables for conducting the electric fluid; Jablochkoff candles, from which the flame is emitted—a chandelier to hold the candles—and a semi-opaque globe to enclose them and the flame. Whether the light be used on the public ways or in the interiors of premises, and whether one lamp only or a large number are employed, this combination of engine power, electrical machine, conductors, candles, and globe, are necessary, the apparatus only differing in size and cost, according to the number of lights.

The motive power can be obtained from steam, gas, water, or other sources; all that at present is needed is that there shall be an engine of some sort sufficiently powerful to work the dynamo-electric machine. With present experience, one-horse power is required for every Jablochkoff candle burning; and for 16 lamps an 18-horse power engine is, I find, calculated on by the Company.

The "Grammes" are now made of three sizes; the first, to supply 16 candles, costs about £400; the second, for 6 candles, about £200; the third, for 4 candles, about £140. M. Gramme is now designing a machine adapted to supply 2 Jablochkoff candles, and one to supply a much larger number than 16 candles.

The "Grammes" are connected with the candles by copper-wire conductors, consisting of cables each containing seven wires, and insulated by a coating of india-rubber. The diameter of the cable is about three-eighths of an inch.

The Jablochkoff candle is a flattish stick, about 9 inches long and barely ¼ inch wide, composed of two sticks of carbon, touching each other at the top, but isolated throughout the remainder of their length by a material called kaolin. The carbon rods at their bases are fitted into brass tubes, which connect with the conductors. Each candle will burn 1½ hours, and to have continuous light it is necessary to have several candles in the chandelier, so as to complete the assigned period of illumination; they are so arranged that a second may be lighted when the first candle approaches exhaustion. A candle cannot be relighted should it happen to be extinguished.

The light is enclosed in globes formed of thick opalescent glass, some of them being 18 inches and some 22 inches in diameter, the former size being the most commonly used. At the bottom of the globe is an onyx plate, fitted with spring clamps, for holding the candles; the conductors pass through the clamps. The chandeliers are usually made to hold 5 candles.

The lamps need a workman to attend to them, and at regular periods

determined by the time a candle is known to burn, to disconnect the electric fluid from the nearly exhausted candle, and transfer it to a new one. This is done by a very simple apparatus, called a "commutateur." Every day the exhausted candles have to be removed and replaced by new ones.

The first public trials with the Jablochkoff candle were made in May, 1870, at the Magasins du Louvre, a large linendrapery establishment at Paris. The light has since been employed at the places on the following list, which has been supplied me by M. Guichard, the Engineer and Agent of the Company. Many of those at Paris I have seen.

Public Ways in Paris.—Place du Louvre, Place de l'Opéra, Avenue de l'Opéra, Place du Théâtre Français, Arc de l'Etoile, in front of the Corps Législatif. *Theatres and Private Places in Paris.*—The Châtelet Théâtre, Hôtel and Magasins du Louvre, Hôtel Continental, Workshops of Messrs. Lecouteux and Garnier, Workshops of Messrs. Corpet and Bourdon, Workshops of Messrs. Ménier, at the Clothing Magazine called La Belle Jardinière, at the *Figaro* Printing Office, at the Concert in the Orangery of the Tuileries. *In French Provinces.*—Monte Carlo, Monaco; Compagnie Générale Transatlantique, St. Nazaire; Neech St. Quentin (spinning mills); Colliard au Couteau; Pierrepont (foundry and iron rolling mills); *Petit Lyonnais* à Lyons (newspaper office); Grenot et Burchet à Roanne (manufactory); Villes à Cours (Rhône.) *Other Countries.*—St. Petersburg, at the Théâtre Impérial; Fort de Cascaer-Portugal; Faust St. Louis, Missouri; Fabuis Boistal, Persia; Puerta del Sol, Madrid; Marine Italienne, Spezzia; De Wendel, Seraing, Belgium (iron foundries).

The most important experiment in public lighting in Paris is that on the thoroughfare extending from the front of the Opera House along the Avenue de l'Opéra to the Rue St. Honoré by the Théâtre Français. The total length of the thoroughfare is about 980 yards, of which 770 yards are in the Avenue de l'Opéra, and the remainder in the open spaces fronting the two theatres.

The number of electric lights is as follows:—

	Lamps.	Candles in each Lamp.	Total Number of Candles.
On the Place de l'Opéra	8	2	16
	2	3	6
Avenue de l'Opéra	28	1	28
Place du Théâtre Français	14	1	14
Total	52		64

As each candle is nominally equal to 100 of the ordinary gas-burners used in the public lamps in Paris, the 64 electric candles are equal to 6400 gas-burners. The line of thoroughfare is ordinarily lighted by about 300 gas-burners. The electric lights, therefore, give something like 20 times as much light as the gas-lamps.

In the Avenue de l'Opéra the columns bearing the electric lamps are placed alternately on each side of the street next the kerbs, at irregular distances, and averaging about 30 yards apart. They are of the same pattern as those used generally in Paris to carry single gas lanterns, but are elevated on wooden pedestals, so that the globes are about 16 feet above the level of the pavement. Those on the Place du Théâtre Français are nearly the same. Those on the Place de l'Opéra have lamps of the ordinary shape, enclosed with opalescent glass, and have two electric candles burning in them at the same time, and are placed on standards which carry groups of gas-lamps. Two standards on the Opera steps each carry three lamps with single candles.

The conductors are placed in tubes formed of stoneware pipes, made water-tight, and laid beneath the footways, and are carried up inside the lamp-posts. At the Place de l'Opéra, where the standards carry more than one electric light, the columns are not large enough to contain the conductors, and they are carried up outside the lamp-posts, and cased with wood. The arrangement to transfer the electric current from one candle to another is inside the bases of the lamp-posts carrying single lamps, and in small enclosures at the bases of the others. This transfer is made by moving a handle upon a plate, and is a very simple operation.

The lights are supplied with electric fluid by three steam-engines with their concomitant "Grammes," two being in empty buildings in the Avenue (the houses in that recently-formed thoroughfare being mostly unlet), the third in a vault in the basement of the Opera House.

The municipal regulations in Paris do not allow steam-engines of more than 20-horse power to be placed in inhabited buildings, otherwise one engine of sufficient power, with three Grammes, would have been sufficent for the entire length of the thoroughfare.

This description of the mode of placing and working the apparatus and lamps applies generally to those on the public ways. The lamps round the Arc de l'Etoile are worked by an engine in the vicinity; the four lamps in front of the Corps Législatif are supplied by an engine in the basement of the building.

The contract of the Company is to keep the lamps alight from sunset to midnight. Shortly before midnight, one of the burners in each gas standard in the street (each standard in the avenue carries three lamps) is lighted by the ordinary gas-lighter. At midnight the engines cease working, the supply of electrid fluid ceases, and the lamps are extinguished almost simultaneously. The proprietors of the buildings in which the engines are placed stipulated that their working should cease at midnight.

The contract for lighting was to have expired on the 15th of October; it has since been extended to the close of the Exhibition, and the Municipality are now considering the extension of the contract until the end of the present year.

It may be mentioned that in Paris it is the custom in such of the streets as are very plentifully lighted, to extinguish a portion of the gas-lamps at midnight, if the season of the year and the state of the weather permits. The main thoroughfares in Paris are much more brilliantly lighted than in London, at all events up to midnight.

The lighting of the Avenue de l'Opéra is brilliant in the extreme; there are no shadows of importance, for the lamps are too near each other to permit them. Figuratively speaking, it is as light as day; and a small coin can readily be seen anywhere on the pavement. It is practicable, in fact, to read almost anywhere, nor can it be otherwise with light nominally equal to 6400 gas-burners, in a thoroughfare not three-fifths of a mile long. The quantity of light may be imagined when it is known that there are in the whole City of London but about 3050 gas-lamps, although here the burners are, I think, slightly larger, and the gas has certainly a higher illuminating power than in Paris. If the only object of street-lighting is to give security to the traffic in passing along the streets, then this avenue is lighted vastly in excess of all reasonable requirements. Whatever the cost of the electric lighting may ultimately be, public ways will not be lighted generally to a similar extent, although particular streets for special reasons may sometimes be so.

The advantages claimed for this light are—

1. That colours can be as well seen as by daylight.
2. That scarcely any heat is given off.
3. That the products of combustion are harmless.
4. That there is no chance of fire or explosion.
5. That the lighting and extinguishing are automatic and instantaneous.

A few words on each of these points.

That colours can be readily distinguished is undoubted; the most delicate tints can, in fact, be seen nearly, if not quite, as well as by daylight. This will make the light invaluable to many trades and manufactories, where the power of distinguishing colours with accuracy is essential. For the same reason it will be useful in markets, for colour is one of the means of judging of the quality of all sorts of edibles, and much marketing is done in great cities by artificial light.

The absence of heat is remarkable. I placed my hand close to the side of a globe in a warehouse in which the light was burning, without experiencing much inconvenience, and it was bearable when held a foot or so above the globe; yet the light then being given off was nominally equal to that of 100 ordinary gas-burners of the Paris size and quality of gas. This absence of heat must render the light of great value in churches, theatres, assembly rooms, workshops, mills, and wherever large numbers of human beings congregate, or are employed in close proximity to each other under artificial light.

As to the innocuousness of the products of combustion, I have seen neither written nor printed report in support of the statement, although such may exist; but this is a point of vital importance, and one which should, and no doubt will, be thoroughly investigated, if it has not been already. That the flame does not exhaust the atmosphere of oxygen, like coal gas, there can, of course, be no doubt. At the Magasins du Louvre, on a hot summer's day, in a part of the warehouse certainly deficient in ventilation, too dark to be used for trade purposes without artificial light, and where an electric candle had been burning for hours, there was a complete absence of that oppressive atmosphere which there would have been had coal gas, giving not 1-50th of the electric light, been consumed. In the reading-room of a large hotel, on a hot night, I noticed the same relative purity of atmosphere, compared with that of a reading-room in another hotel where numerous gas lights were burning.

I am told also that those who have made experiments with it in a small chamber have not suffered as they have from the products of combustion when using coal gas, and generally, as far as I can gather it, it is the opinion of those who use this light that the atmosphere is but little, if at all, affected by it. If there be this absence of vitiation, it is a quality not less valuable than the absence of heat, and hygienically gives the electric light a vast superiority over coal gas as now manufactured and consumed; nevertheless, ampler experience, it seems to me, is needed to verify the statements.

That the light diminishes the chances of fires and explosions is obvious, and needs no comment.

The automatic and instantaneous lighting and extinguishing of the lights offer some advantages; but not such as are of great importance, excepting in the case of public lighting.

The electric light is intensely powerful, and, when looked at naked, is dazzling and painful to the eye; for an instant, indeed, it seems to kill the eyesight. Enclosed in the opalescent globes, it does not dazzle, nor, from the limited use I have made of it, did it appear in any way offensive or trying to the eyesight; but whether it will be injurious to the eyes of those using the light to work by habitually, and for many hours daily, can only be ascertained after a considerable period of time; the effect cannot be expected to be determined quickly.

The intensity of electric light, as compared with gas light, I take from the account given to me by the Electric Light Company, assuming it to be correct; but when general comparison is made with gas-burners, it should be held in mind that Paris gas has not the illuminating power of London gas, the standard and mode of comparison in Paris being different from ours. Mr. Heisch, the Gas Examiner for the Corporation of the City of London, informs me that whilst the illuminating power of London gas has a minimum of 16 candles, that of Paris has but 12 candles, or 25 per cent. lower power than at London. This is adopting the English standard for comparison.

The opalescent globes are considered by the Electric Light Company to diminish the quantity of light by about 30 per cent. The late Dr. Letheby, considered that similar globes intercepted one-half of the light, and, from general observation, my impression is that 50 per cent. is the least that is lost by their use, and probably that it is even more. The use of such globes is, however, essential. It may be broadly said, therefore, that one-half of the nominal intensity of the light will be always lost—that the 100 gas-burner power is but 50 gas-burner power, a point also to be held in mind in considering its practical illuminating power compared with that of coal gas.

It has been stated that the light does not vary materially in intensity. My observations lead me to a different conclusion. I looked carefully at the lights on different public ways, as well as at those in the interiors of premises at various hours of the night, and under various conditions of atmosphere, and it seemed to me that the differences in intensity were very considerable. I should say (although it must be taken as a mere general opinion) that it varied at times as much as from one-third to one-half in illuminating power; this variation occurred at some lamps every three or four seconds.

The variations were not always noticeable in the same lights. Those that varied much on one night were burning steadily on other nights. One evening, at the Arc de l'Etoile, the light was remarkably steady; and on the same evening in the Avenue de l'Opéra, there were at times very great variations.

In the Magasins du Louvre, an electric light which was burning in the daytime varied very considerably in intensity; it seemed to me to do so more than any other electric light that I noticed—it amounted to what would be generally understood by the word "flicker," and was unpleasant to the eye; it may be remarked that the noise made by the engine was perceptible at this lamp, although the flame was a long distance from the machines.

The volume of electric light in the Avenue de l'Opéra and adjacent places is, however, as before said, so great, as compared with that usually given in any public thoroughfare, that the variation does not affect the convenience of the public, nor would it even affect the comfort of any one using the light for reading by it. I could read the small print of an English newspaper by the lamps in front of the Corps Législatif at about 30 yards off, and in the Avenue almost anywhere; but it is not needful that streets shall be so lighted that persons should be able to read in all parts of them.

These variations in intensity may be attributable to defects in the system or in the apparatus, and perhaps to irregularity in working the machines. They show that care is needed to obtain a steady light from the electric fluid, and that the system is by no means perfect.

The colour of the electric light, seen through the opalescent globes, varied with the degree of intensity, from a nearly pure white to one with the faintest tint of blue in it. I have seen it stated that there is a light pink tint at times in the light, but did not observe it.

Difference of opinion exists as to the pleasantness of this light; to me it is unpleasant, and its effect ghastly; but then the light of the moon to me is unpleasant, and the electric light somewhat resembles moonlight. No doubt it suffers by contrast with the gas lights, as they in their turn suffer in brilliancy by the power of the electric light; but when looking at it for

some time, and so as to avoid contrast with gas light, the effect upon me was exactly the same; and, although the gas flames looked afterwards dull and poor by comparison with it, yet they were a relief to my eyes. This objection to the colour from the electric light will probably vanish with custom; it certainly will not prevent the employment of the light if it presents advantages in other respects, and for street lighting I apprehend the whole question will ultimately resolve itself into one of cost.

Where this colour is deemed objectionable, it can be removed by having the globes made of coloured glass. This is done in the auditorium of the Théâtre du Châtelet, at Paris, where the colour from the globes enclosing the electric light is nearly the same as that from the ordinary gas globes, burning by the side of them.

The Company, in its prospectus, states that it can produce 16 electric lights, each equal to 100 gas-burners (Paris size of burner and quality of gas), for about 8s. 4d., or slightly more than 6d. per lamp per hour. This allows for the cost of working a "Gramme" and an 18-horse power steam-engine, but nothing for interest on capital expended in the apparatus. In districts where coal is cheap, the Company consider the cost will be reduced simply to the price of the Jablochkoff candles and the grease and working expenses of the motors and the dynamo-electric machines.

They also state that at the Magasins du Louvre, and in the courtyard of the Hôtel du Louvre, 201 gas-burners, which nightly cost £3 12s. 4d., have been replaced by 16 electric lights, which cost £2 10s. 11d., being an economy of 30 per cent., and in addition to which 3½ times as much light is given by the electric light.

At the Magasins du Louvre I found upon inquiry that they had been working the light with a 20-horse power engine since March, 1877. They are now erecting additional engines up to 70-horse power, to complete the lighting of the magasin, and the corridors and large spaces of the hotel. I saw these engines in the course of erection. One of the leading officials of the establishment told me that they expected the saving in the cost of lighting would be very considerable.

This extension of electric lighting in a large commercial establishment after a long trial certainly leads to the inference that the light is found economical; nevertheless, the absence of heat and the possibility of telling colours may have as much to do with the adoption of the electric light at the Magasins du Louvre as the saving in expenditure, looking at the fact that the Magasin is a large linendrapery establishment.

The Electric Light Company has recently given estimates for supplying the apparatus and everything necessary for lighting four electric lamps at a club-house in Paris, at a cost of £465, and estimates the cost of the four lights at about 2s. 10½d. per hour, or 8½d. per lamp per hour. I assume that each light will, as elsewhere, be equal to 100 ordinary Paris gas-burners. The number of gas-burners in the establishment which are to be superseded by the electric lights is not stated.

Messrs. Higgs and Brittle (I quote from a paper read and a discussion at the Institution of Civil Engineers) consider that, in respect of cost, there is a ratio of four to one in favour of electric lighting, assuming the light to be proportional to the horse power employed, and that for large spaces electric lighting may be taken at about a quarter, or even a fifth, the cost of gas, steam being used as motive power, and wear and tear being reckoned in the estimate. It is also stated that with a gas-engine as motor, the ratio has been from one to three in favour of the electric light; and that at Monsieur Dieu's workshops at Davours the cost per hour for gas has been about 2s. 0¾d., as compared with about 1s. 7½d. for electric lighting. Others consider that gas costs 2½ times more than the electric light; another says that the economy is two to one in favour of electric lighting, assuming that the lighting is adapted to the convenience of those using it, and not in the ratio of the light intensities.

Again, it is stated by Mr. E. J. Reed, C.B., that a cloth factory at Rouen, lighted formerly by 160 5½-feet per hour gas-burners, is now lighted by six electric lights, and that the economic result shown by five months working is an annual saving of £56 16s. 6d., or 22·6 per cent., interest and depreciation being taken into account. This statement is met by another, that gas at Rouen is 7s. 2½d. per 1000 cubic feet, and in London but 3s. 6d.; and that if, for the estimate, gas be taken at 3s. per 1000 (the price charged by one Metropolitan Company) the economy would be 33 per cent. in favour of gas. Mr. Sugg considers that the electric light would, at that factory, cost 11s. 5d. per hour, against 4s. 4½d. for gas, if the gas were consumed in a scientific manner from the best form of burners, and lights equally distributed. He is himself the designer and patentee of well-approved burners, but he does not say what burners he would use to make his comparison.

As to lighting the public ways, M. Alphand, the Director-General of Public Works in Paris, considers the cost of the light is something like four times that of gas; but this does not take into account the great additional light given by the electric lamps.*

Mr. Hunt, the Engineer to the Birmingham Gas-Works, comparing the cost of the electric with gas light for street illumination, says that, taking into consideration the difference in the distribution of the light—the one mode of lighting being by numerous burners distributed where most favourable for the purpose, the other being in concentrated volumes at large distances from each other—the balance is considerably in favour of gas.

There is, in fact, difficulty in determining exactly the relative economic values of the two lights. It cannot be done by taking equal and concentrated quantities of light, because gas, by its divisibility, enables the light to be distributed at will, and uniformity of illumination to be obtained without the consumption of more gas than is needed for the object. The electric light, on the contrary, cannot have its intensity much lessened, nor be divided into many small flames placed at convenient distances apart, but must be taken in intense volumes from burners placed at such distances as the nature of the light, in adapting it to the use to be made of it, will permit; in other words (and speaking quite generally), a given quantity of gas may be distributed through many channels, and consumed at a large number of gas-burners, but one electric light, nominally giving light equal to 100 gas-burners, cannot even be conveniently separated into two lights, each equal to 50 burners. Thus, to make the electric light available, there must be an amount of light at places very far in excess of the requirements.

Upon this vital question of cost it will be seen, therefore, that there are great differences of opinion, and among those competent to form one, as to the relative economy of the two classes of light; no doubt there are immense interests at stake on the question, which may warp the judgments of many, and render the truth somewhat difficult to arrive at, but the balance of testimony seems to me to be only in favour of the economy of the electric light where the conditions are very favourable to its use.

The light, of course, is well adapted for lighthouses, for carrying out large building operations at night, and for various special purposes, which it is not necessary to refer to here.

I now pass to the consideration of using the electric light for lighting the public ways of the City.

* I take this statement from the report of Mr. Stayton, the reply to my communication to M. Alphand on the subject not having arrived.

For this purpose it will, firstly, be necessary to find situations for the steam-engines and "Grammes," and whether vacant ground or the basements or vaults of premises be used, the accommodation will probably have to be paid for. The wires can be as readily laid beneath the footways, and the lamp-posts be as readily used, here as in Paris.

It will have to be determined whether the electric lamps shall, as in Paris, be extinguished at midnight, and the gas-lamps be then lighted, or whether they shall be continued throughout the night. The climate of London, and the habits of the people, are different from those of Paris. It is not here customary to diminish the light after midnight, and there is not the margin of light to enable it to be done.

If kept alight until midnight only, it is possible that one man can attend to each engine in a thoroughfare, and to the transfer of the electric current from time to time. I do not think he could do more, and it might not be safe to depend upon one man. It would be heavy work for one to attend to the lights if burning from sunset to sunrise during the long nights of winter.

A workman during the day will have to replace the exhausted candles with fresh ones, and clean the lamps. It is said that in Paris they need scarcely any cleaning; in London, I think, they will want cleaning, for here the gas-lamps get much dirtier in a short space of time than they do in Paris.

In Paris the chandeliers carry five Jablochkoff candles, which are sufficient for 7½ hours consumption. If the electric light be continued in London from sunset to sunrise during the winter, some arrangement must be made either for the chandelier to carry more candles, or for fresh candles to be introduced during the night into the chandelier, or for lamps to be used alternately. No doubt all this can be accomplished—it is mentioned only to show what will have to be done.

As comparison of cost will no doubt be the first point of consideration, it will have to be determined whether the streets shall have a much greater amount of light than is now given by the gas-lamps, or only sufficient electric light to give something more—say, double the light from the gas. This would be the best way of arriving at a comparison of the cost of the lights, but not the best way of making a startling show of what the electric light can do.

There are various points, therefore, to settle before a reliable estimate of the cost of lighting the public ways with the electric light can be made, or just comparison between its cost and that of gas be arrived at.

I refer to another point before closing this section. If the public ways are entirely lighted by electricity—and I do not think any system will be permanently employed needing two different classes of light to be used nightly—the possibility of an accident to a Gramme or steam-engine must be considered. In the event of this occurring, the whole of the lights dependent upon the inoperative apparatus would be extinguished, and the streets left in darkness. This contingency could only be obviated by having auxiliary engines ready, which would lead to considerable expense.

It may be said that there is the chance of an accident occurring to a gas-holder, and of a whole district being placed in darkness, for such a thing has actually occurred; but experience has shown that the probability of such an occurrence is remote, whereas, out of a large number of motive engines and electrical machines, there is much probability of one or other going wrong at some period.

Considering the facts placed before you, and that at present the electric fluid cannot be transmitted efficiently a greater distance from a station than about 1000 yards, and considering the expense of providing stations, steam-engines, and electrical machines, with their attendants, it appears to me not probable that the electric light will compete in point of economy with gas for lighting the public ways.

There are, however, places where the convenience of the large traffic might justify the expense of employing it during the busiest hours of darkness—such, for instance, as by the King William statue, at the space in front of the Mansion House, the Circus at the foot of Ludgate Hill, Charing Cross, the Circuses at the ends of Regent Street, the northern end of Westminster Bridge, and similar places where there is a great foot and carriage traffic during many hours after sunset. Using it on the Thames Embankment or in the centres of the Parks, both of which places have been suggested, might, no doubt, make a brilliant and effective spectacle, but it would be a waste of money, there being in neither place much traffic to benefit by the light.

With regard to private establishments the conditions are different. In most large workshops and manufactories, motive power, if not already existing, can be introduced with possible advantage for other purposes, and worked relatively cheaper, than if employed only for public lighting. There the electric light may, it is probable, even now be employed with economy; there, also, its superior hygienic qualities would be appreciated, and in many cases, but not in all, the absence of heat will be thought an advantage. In dwelling-houses, or in small workshops, where but few gas lights are used, it will not, I think, be found economical. Such are the advantages which gas possesses in enabling any quantity of light to be obtained at the exact spot needed, and extinguished at once when done with, that until the electric light can be similarly divided and utilized, it is not likely to supersede gas for limited consumption.

These opinions are, of course, founded upon the present stage of electric science in its application to lighting, but great developments have been claimed for it even since this report was commenced; and looking at the advances made during the last few years, and even months, at the attention widely given to it by men of science, at the inducements which the profits arising from success hold out, it seems to me that we may look forward to a speedy and greater development of its utility.

It will certainly stimulate the Gas Companies both to improve the quality of their gas, and suggest a more perfect mode of consuming it; and they will probably have to reduce its price. I look forward to a time, not far distant, when gas will be sold at 2s. 6d. per 1000 cubic feet, and even less; thus, by the competition between the lights, the public will be large gainers.

Although I do not think that at present the electric light can compete with gas in point of economy for lighting the public ways, yet an ample experiment should be made to determine this point, and to show its value for street illumination. There is no subject of recent years on which the public appears to entertain such great expectations as it does with regard to this new light, and looking at the large interests which the Commission represents, I beg to recommend that as early as possible an ample experiment be made by lighting with it, during the winter months, one or more of the public thoroughfares within its jurisdiction.

Queen Victoria Street and the Holborn Viaduct are both suitable for this purpose, each having subways. Queen Victoria Street is the longer of the two; but as the Metropolitan Board of Works retains the subways under its control, the Commission would have to obtain permission to enter them, and inconvenience might arise, owing to a divided jurisdiction. The Holborn Viaduct subways are under the control of the Commission, and I therefore recommend the Viaduct as a suitable place for making a trial of the electric light.

(Signed) WILLIAM HAYWOOD, Engineer and Surveyor.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of this district continues extremely quiet, and although for round coal late rates are generally maintained, there is a downward tendency in the inferior classes of fuel, owing to sales being forced in the market by needy holders. The house-coal trade is very dull, the inquiry for best coal being extremely small for the time of year, and the demand seems to be chiefly for the inferior classes of round coal suitable for house-fire purposes. In gas-making coals there is no material change to notice; deliveries are being made to gas companies on account of contracts, but there is little else doing, and there seems now to be very little disposition to enter into three and five years contracts, even if they were offered, for which so much inquiry was made during the summer, gas coal consumers evidently preferring to wait the further development of the electric light before committing themselves to long forward engagements. Common coal for steam and forge purposes is as bad to sell as ever, and the supplies of burgy and slack are in excess of requirements, with a disposition amongst colliery proprietors to enter into contracts at slightly lower figures, owing to the probability of these descriptions of fuel being a drug during the winter. The quoted prices at the pit mouth remain about as under:—Best Wigan Arley, 9s. to 10s.; common ditto, 7s. to 7s. 6d.; Pemberton four feet, 6s. 6s. to 7s. 6d.; screened gas coal, 6s. 6d. to 7s. 6d.; common coal, 5s. to 6s.; burgy, 4s. to 4s. 6d.; and slack, 3s. to 3s. 6d. per ton.

The shipping trade continues in a stagnant condition, and extremely low prices have to be quoted to secure orders.

In the iron trade the amount of business doing is very small. The present requirements of consumers appear to be of the most trifling description, and there is so little confidence in the future that the extremely low prices now ruling in the market offer very little temptation to speculative transactions. Lancashire makers of pig iron are taking less than their nominal list rates to secure orders, and finished iron makers would be open to offers below their quoted prices to secure good specifications.

Most of the works are still only running part time, and a reduction of 5 per cent. in wages is being put in force by some of the principal makers.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There was a continued scarcity of small sailing vessels in the Tyne last week, and as such were wanted especially to carry cargoes of gas coal to the bye-ports, freights advanced about 6d. per ton. The shipments of gas coals in the Tyne fell off a little last week. The fact is, there is not the usual winter's trade, so far. Many of the gas companies evidently made up their stocks of coals during the summer, through the opportunities which were afforded them of buying quantities at low prices. At the beginning of the winter there is not likely to be any great rush. One or two of the pits have their men under notice for a reduction of wages. No doubt, on account of the electric light scare, it is not likely there will be many long contracts for coals made this side of Christmas. Gas companies who have, or are about to get through their contracts, are bargaining for a supply over two or three months.

A few contracts are being arranged by some of the Continental gas companies, but foreigners seem to have the impression that coals are likely to be lower, and they are not very much disposed, at the present time, to enter the market. The steam coal owners have given their new notice of a reduction of wages, and the lengthening of the hours of labour. In all probability this movement will be general in the coal trade, so that, at the present moment, it is difficult to say what will be the altered relations between this time and Christmas. It is pretty clear that, at least in steam coals, North Country owners are undersold by other districts. They allege that this arises from the fact that they pay higher wages, and have shorter hours of labour than their competitors.

The prospects of the Northumberland pitmen for the winter are very dark. Under the most favourable circumstances it would seem as if broken time would be the rule rather than the exception. Under these circumstances it would seem rather strange of the masters asking the pitmen who work by the piece, and not by the hour, to add another hour a day to their day's work; but it is very material to the owners. The expenses of a pit are the same if it works six hours or seven; and the gain of an hour a day is very material to the owner.

To present appearance, it is every way probable that the slight advance in the rates paid to vessels in the coasting trade will be maintained this side of Christmas, and the same observation applies to gas coals shipped to France and Ireland. Steam collier rates are pretty steady.

The general manufacturing business of the Tyne is dull. There is not much inquiry for iron, and there have been large arrivals of bar lead from Spain. The chemical market is dull, and prices extremely low.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

An extraordinary meeting of the Lanark Gas Consumers Company, Limited, was held last Friday—Provost Brown in the chair—for the purpose of considering the propriety of increasing the capital of the Company, sanctioning the completion of certain improvements in connection with the storeage and distribution of gas, and reducing the quorum for the annual meeting from 20 Shareholders to 10, all in terms of notice of motion given at the annual meeting held in August last. The former proposal was deferred for a year, and the latter was unanimously agreed to. In the course of the proceedings it was stated that much improvement was necessary, in order that the work of storeage and distribution might be conducted in the most efficient and economical manner.

A meeting of the Arbroath Gas Corporation was held last Monday, chiefly with the view of considering a proposal to increase the salaries of the Manager, Mr. Terrace, and the Clerk, in accordance with a recommendation from the Committee of Management, and in consequence of the highly satisfactory condition of the works and the flourishing state of the revenue. On the motion of Provost Shield, the minute of the Committee was adopted, and an increase of £50 per annum was made to the salary of Mr. Terrace, partly as Manager and partly as Treasurer; and £10 was added to the Clerk's salary.

The Rothsay Corporation gas accounts for the past year show a profit of £172 8s. 0½d., besides a reduction of 5d. per 1000 feet in the price over the entire year.

There seems now to be some hitch in connection with the proposed acquisition of the local gas supply undertaking by the Burgh of Johnstone Police Commissioners, the Gas Committee being about to withdraw, if they can, from the negotiations to purchase the gas-works. It is stated that a motion was carried at a late meeting of the Committee to depart from the negotiations altogether, the alleged reason being that the prospective price to be paid is likely to be too large when considered in connection with the great progress recently made with the electric light. There is just a possibility, however, that the Gas Company will enforce all the rights conferred on them by the Burghs Gas Supply Act.

The streets of Duntocher, an important manufacturing village in Dumbartonshire, are now lighted by gas nightly—for the first time during eight years, which is the length of time since the Trustees of the late Mr. Dunn ceased to take charge of the lighting. For some time past the place has again been growing in importance, and the public spirit of the inhabitants seems to have been keeping pace with it.

At one of the Municipal election meetings, held in Leith during the past week, one of the speakers directed attention to the importance of the Town Council taking over the gas supply. Judging from the experience of Manchester and other places, he said he believed that if the gas undertaking was owned and managed by the Town Council they could, with the amount saved, improve the whole of Leith without the need for taxation under the Artisans Dwellings Act. Bailie M'Intosh, who presided, remarked that if they waited a little time longer they would get the gas business transferred to them cheap enough, if the system of lighting by gas was superseded by the electric light.

The "gas question"—including the extensions of the gas-works now in progress, the recent increase of the Manager's salary, and the probability of gas light being superseded by the electric light—cropped up very prominently at the ward meetings held in Paisley last week. Speaking of the electric light and of the fall in gas stocks, Bailie Eaglesim remarked, at a meeting of the Third Ward electors, that any further enlargement of the plant or works would now be carefully considered. At another meeting Bailie M'Gowan said he had done in the matter of the Manager's salary as he would have done in his own affairs. Mr. Hislop, the Gas Manager, had, by a process of his own invention, which he had patented, but of which the Gas Commissioners obtained the benefit without charge, saved them hundreds of pounds in the matter of purifying spent lime, and enabling it to be used again and again. Several members of Council referred to the great progress of the gas manufacture in Paisley. When the works were handed over to the town in the year 1845 the make was 40 million cubic feet; in 1870 it rose to 86 million cubic feet; and during the past year the make was increased to 133 million cubic feet. Hence the necessity for additional productive power and increased storeage.

Referring to the letter in last JOURNAL from Messrs. Leslie, regarding the Irvine Water-Works, permit me to say in reply that if the works are not yet *formally* handed over to the Water Commissioners, they are at least under the management of the *paid Superintendent* of that body; that I am not "your Correspondent at Irvine;" that I am not actuated by any feeling in the matter; that I do not know any one connected with the Local Authority of Irvine; and that the source of my information is the report in one of the local papers, which, on reading afresh, seems to justify all that I said in your issue of the 17th inst., which certainly was not very much. If this statement does not satisfy Messrs. Leslie, I must ask your permission to quote, in my own defence, from the report to which I have been indebted for my information.

There has recently been completed and inaugurated a water supply scheme for the villages of Wemyss, Buckhaven, &c., in Fifeshire. The works, which were commenced sixteen months ago, are of a very complete character, and are constructed so as to give an average supply of 30 gallons per head per day to a population of 8000, besides compensation water. The gathering-ground is at Carriston, in the parish of Kennoway, and the pipe track is about 16 miles. The reservoir, which is situated about 300 feet above the sea level, has a capacity of 54 million gallons, a quantity which is adequate for the supply of the district for 133 days. Mr. John Sang, C.E., Kirkcaldy, planned and laid out the works. Mrs. Erskine Wemyss, of Wemyss Castle, assisted by Mr. Randolph Wemyss, the "young laird," Lord Charles Beresford, and a large party of ladies and gentlemen, performed the ceremony of turning on the water. The probable cost of the works is set down at well nigh £25,000.

The people of Newport-on-Tay have not made a "burning question" of their water supply. Under the guidance of clear-headed and judicious men, acting after careful deliberation, they have adopted the best possible scheme—the conveying of the Lintrathen water from Dundee over the Tay Bridge. This scheme will be unique—water first of all brought from the Forfarshire Highlands, more than 20 miles, to Dundee, and then carried two miles over a bridge, across the estuary of the Tay, from one county to another. The manner in which the Authorities of Dundee and Newport are co-operating, and the North British Railway are affording facilities for the supply, is highly creditable to them all.

At the last meeting of the Ayr Town Council a report was submitted from Mr. M'Derment, C.E., the surveyor of the water-works, which showed that, at the date of the report, Grange reservoir had been about 8 inches from being full, and that Carchine reservoir had contained about 8 feet 3 inches, equal in all to 7 million gallons of water. It also appeared that the 12-inch supplementary pipe into Carchine reservoir would soon be available for augmenting the supply.

The Falkirk Pollution Commissioners have decided to appoint Messrs. A. and J. Leslie, civil engineers, Edinburgh, to make a survey of the estate of Callendar in view of a new water supply, which is very much wanted for the town and district.

A movement is now being made by the Dunfermline Parochial Board, acting as the Local Authority for the villages of Limekilns, Charlestown, and Crossford, to have the said villages formed into a special supply district. A motion to that effect was proposed by the Earl of Elgin at a meeting of the Board held on Thursday week, and, after some discussion, it was carried unanimously. It is thought that, eventually, the Devon scheme will be carried to the villages in question, although the expense is likely to be very great, probably 2s. per £1 of rental.

The Greenock Water Trust held a meeting on Tuesday week, when the annual financial statement was made. It was reported that the past year's revenue was £23,192 2s. 4d., and that the expenditure was £23,411 9s. 9d., showing a deficit of £219 7s. 5d. This deficit was occasioned by the payment to Sir Michael R. Shaw Stewart of £451 19s. 3d. for casualties, which had been accumulating for some years. The domestic rate was fixed at 8d. per £1 of rental, and the public water rate was reduced to 1½d. per £1. It was also reported that the quantity of water in store amounted to 301,775,133 cubic feet, or about 86 days supply for all purposes. It is proposed to effect a junction of Loch Thorn with Loch Gryfe, which may involve a cost of about £5000. By carrying out this proposal a more regular supply of water will be got, more especially for the millowners in the winter months.

Mr. Leslie has reported to the Galashiels Corporation Water Committee that his efforts to stop the leakage at Knows Dean reservoir with cut oakum had proved unavailing, and that operations were now being carried out to fill up the crevices with grouty cement; after which it would be puddled with clay, and filled in. The water rate has been fixed by the Town Council at 1s. 11d. per £1 of rental.

Nothing of any importance can be said regarding the iron and coal trades that is fresh.

CASTLE DONNINGTON GAS COMPANY.—The annual meeting of this Company was held last Wednesday week, when the following report was adopted:—"The Directors, in presenting their twenty-fifth annual report, have great pleasure in informing the Shareholders that the works, mains, and services are in a satisfactory and sound condition. During the past

year the Company have extended their mains to Hemington, and trust the extension will be liberally taken advantage of by the inhabitants, and prove beneficial to the Company. They have also made arrangements, and are now supplying the Midland Railway Company with gas. The Shareholders will observe that, although a liberal allowance has been made in the price, the public have not availed themselves of gas to the extent the Directors anticipated. The consumption has not been equal to that of last year. The amount paid for gas coal and lime, however, is considerably less, and your Directors consider the receipts satisfactory, and show a fair profit upon the consumption. It will also be seen that the sale of lime, coke, tar, &c., has considerably increased. The accounts show a balance of £331 17s. 9d., out of which a dividend of 5 per cent. is recommended, the remainder to be carried to current account." The retiring Directors, Messrs. Johnson, Shipley, Attwood, and Bywater, were re-elected. Mr. Towle was re-elected Chairman, Mr. Attwood, Treasurer, Mr. Burton, Auditor, and Mr. Clifford, Secretary.

GAS AND THE BINDINGS OF BOOKS.—That old and much-abused servant, gas, seems about to be purged of at least one of its alleged sins. It has always been supposed to destroy book leather, but Professor Wolcott Gibbs, of Harvard University, U.S.A., writes to an American contemporary: "Some time since I made an examination of the bindings of books in the Public Library, supposed to be injured by the products of the combustion of coal gas. I arrived at the conclusion that there was no sufficient evidence to show that such was the case. I have since made a careful examination of books in the Athenæum, College, and Astor Libraries and have found precisely the same state of things. You are aware that gas has never been used in the College and Astor Libraries at all, and that in the Boston Athenæum gas is largely used in the reading-room, but not in the library proper. I found in each a large number of old books bound in calf, which presented the same appearance as those which I saw at the Public Library. These were all old books, and all bound in calf. Mr. Wilson, binder to Little and Brown, and a man of large experience, told me that he was satisfied that the trouble was in the tanning of the leather, and not in the action of gas, the older kinds of leather used by binders being of poor quality and badly tanned. I analyzed a number of samples of the leather in my own laboratory, and find no free acid whatever. On the whole, therefore, I see no reason to change my opinion in the matter."—*Sanitary Record.*

REDUCTION IN THE PRICE OF GAS AT PADIHAM.—At the meeting of the Padiham and Hapton Local Board on the 17th inst., Mr. Metcalf, in pursuance of notice previously given, moved—"That the price of gas be reduced 5 per cent. per 1000 feet, or as near as possible without making fractional parts." He said he thought the Board would agree that they should make a little reduction. The price of gas at Padiham was 3d. per 1000 feet more than at any other place within an area of ten miles. He knew of no place near where so much was charged, except at Brierfield, where the charge was 5s. per 1000 feet, and in that case there was a reduction of 10 per cent. made, which brought down the price to about the same as at Padiham, or a little lower, as they only allowed 2½ per cent. It would be found from the last returns that they could afford to make a reduction. From those returns, it would be seen that they had made a profit of £1900 from the gas-works, so that, after deducting the £1100 paid for annuities, there was a net profit of £800. The realization of such a profit spoke well for the Manager. Mr. Green seconded the motion. Mr. Whitehead asked whether anything was allowed for depreciation. The Manager (Mr. Smith) replied in the negative, and explained that the late Gas Company did not allow anything for depreciation, inasmuch as there were repairs and renewals every year. The motion was unanimously adopted. Subsequently, the Chairman said the Gas Manager had reminded him that there was no date fixed for the reduction to take place. After some remarks had been made, it was resolved that the reduction should date from the 1st inst.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

4097.—HACKNEY, W., Newport, Monmouth, "Improvements in regenerative gas furnaces." Oct. 15, 1878.

4100.—VARLEY, F. H., Newington Green Road, London, "Improved means of producing electricity and the electric light." Oct. 15, 1878.

4102.—WIRTH, F., Frankfort-on-the-Maine, Germany, "Improvements in automatic gas-burners." A communication. Oct. 16, 1878.

4112.—JENNINGS, G. and G., jun., Stangate, London, "Improvements in water-closets, and in traps and appliances for controlling the supply of water." Oct. 16, 1878.

4114.—WELCH, E. J. C., Manchester, "Improvements in the method of dealing with electric currents, whereby they may be divided and distributed through any required number of circuits for lighting and other purposes." Oct. 16, 1878.

4116.—FORBES, G., Glasgow, "Improvements in electric lighting." Oct. 16, 1878.

4120.—BROMHEAD, H. K., Glasgow, "Improvements in the purification of tidal rivers, estuaries, and coasts, the same being applicable for the removal of sewage from populous places or works not situated on rivers or coasts." Oct. 17, 1878.

4132.—HICKLEY, A. S., Kentish Town, London, "Improvements in or applicable to electric lighting apparatus." Oct. 17, 1878.

4163.—ARONSON, J. N., Bedford Row, and FARNIE, H. B., Great Marlborough Street, London, "Improvements in the application of electricity, being an imperishable substitute for carbon, and especially adapted to illumination." Oct. 18, 1878.

4170.—COPLEY, J. C., Nottingham, "An improved process for rendering water permanently hard." Oct. 19, 1878.

4180.—PULVERMACHER, I. L., Regent Street, London, "Improvements in producing light by electricity." Oct. 19, 1878.

4196.—HADDAN, H. J., Westminster, "Improvements in waste-plugs." A communication. (Complete specification.) Oct. 21, 1878.

4203.—BROMHEAD, H. K., Glasgow, "Improvements in the purification of tidal rivers, estuaries, and coasts, the same being also applicable for the removal of sewage and noxious matters from populous places or works not so situated." Oct. 22, 1878.

4204.—HADDAN, H. J., Westminster, "Improvements in valves and cocks." A communication. (Complete specification.) Oct. 22, 1878.

4208.—SIEMENS, C. W., Westminster, "Improved means and apparatus for electric illumination." Oct. 22, 1878.

4212.—BRIGHT, C. T., Westminster, "Improvements in lighting by electricity." Oct. 22, 1878.

4223.—JOHNSON, J., Pendleton, and HILTON, M., Prestwich, Lancs, "Improvements in arrangements and apparatus for the manufacture of gas." Oct. 23, 1878.

4226.—EDISON, T. A., New Jersey, U.S.A., "Improvements in the method of and means for developing electric currents, and lighting by electricity." Oct. 23, 1878.

4231.—YOUNG, F., Clapton, and DALE, C. M., Regent's Park, London, "Apparatus for the increase and diffusion of all kinds of artificial light." Oct. 23, 1878.

4253.—RAMAGE, P., Edinburgh, "Improvements in valves for controlling or regulating the passage of fluids and liquids." Oct. 24, 1878.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1355.—BILLING, C. E., Hatton Garden, London, "Improvements in gas-burners and reflectors for heating and warming purposes." April 5, 1878.

1861.—SIMON, H., Manchester, "An improved blowing machine applicable for drawing or forcing fluids." A communication. May 9, 1878.

2003.—HADDAN, H. J., Westminster, "Improvements in apparatus for the generation and application of electricity for lighting, plating, and other purposes." A communication. May 18, 1878.

3315.—SIEMENS, C. W., Westminster, "Improvements in apparatus for electric lighting." Aug. 22, 1878.

3250.—WILDE, H., Manchester, "Improvements in producing and regulating electric light." Aug. 17, 1878.

PATENTS WHICH HAVE BECOME VOID
BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

3430.—HARLOW, R., "Improvements in valves." Oct. 2, 1875.

3440.—JEWITT, H., "Improvements in Argand gas-burners." Oct. 4, 1875.

3490.—LAKIN, J. P., "An improved dry slide for gas-fittings." Oct. 8, 1875.

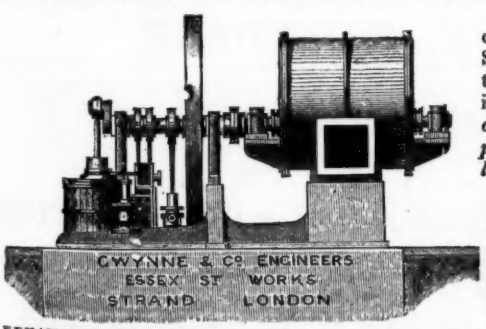
PATENTS WHICH HAVE BECOME VOID
BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

2734.—MACFARLANE, J. R., "Improvements in apparatus for charging and drawing gas-retorts, and for other purposes." Oct. 14, 1871.

2767.—HOLDSWORTH, J., "An improved feed or supply-pipe for supplying illuminating gas to gas-burners." Oct. 18, 1871.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

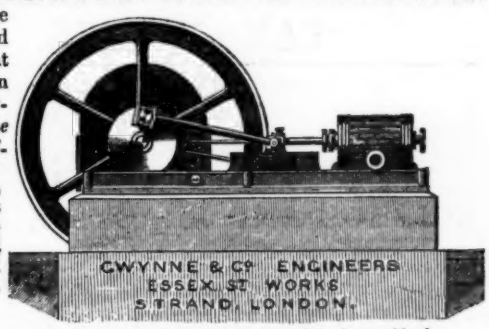
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

WANTED, a Re-engagement as MANAGER of Gas-Works; 15 years experience. Address R. D., 25, Acklam Road, Westbourne Park, LONDON, W.

WANTED immediately, a Practical MANAGER for the Huyton and Roby Gas Company (near Liverpool). Salary £150, with house, coals, and gas. He will also have to take charge of the books and accounts.

Applications to be sent to EDWARD BANNER, Esq., Roby, near LIVERPOOL.

WANTED at once, a Carbonizing FOREMAN at Gas-Works, making 25 millions per annum. New retorts, new engines, and exhausters.

To a first-class man good wages will be given in proportion to results. House on works, with coal and gas.

Apply, stating terms, to COTTON AND MARDON, Gas-Works, UXBRIDGE.

WANTED immediately, a Manager for small Gas-Works. He must thoroughly understand the Manufacture and Distribution of Gas, Main and Service Laying, Meter Fixing, and Index Taking.

Apply, before Monday, Nov. 4, stating salary and previous employment, to the SECRETARY, Staplehurst Gas Company, Limited.

STATION-METER FOR SALE.

THE Gas Committee of the Rochdale Corporation offer for SALE a STATION-METER, capacity 25,000 cubic feet per hour, 12-in. Connections, Hydraulic Valves, and Bye-Pass, and all other necessary fittings. The Meter to be removed in consequence of extensions.

Any further information thereon can be had from the Manager at the Works.

Tenders, endorsed "Tender for Station-Meter," must be sent to me on or before the 13th inst.

By order,
ZACH. MELLOR, Town Clerk.

Town Hall, Rochdale, Aug. 2, 1878.

TRURO GAS COMPANY.

WANTED, by the above Company, a thoroughly practical Man as a GAS-FITTER. One who understands bronzing and lacquering would be preferred.

Applications, enclosing testimonials, with references, and stating wages expected, to be addressed to the Secretary, Mr. J. HAMILTON.

Dated, Truro, Oct. 1, 1878.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

FOREMAN STOKER required, who understands an Engine and Exhauster. Must have a good character for sobriety, &c.

Apply to Mr. C. E. BOTLEY, Gas-Works, Wormwood Scrubs, Kensal Town, LONDON, W.

ROMFORD GAS AND COKE COMPANY, LIMITED.

THE Directors invite Tenders for this Company's Surplus TAR for Twelve months, commencing 1st of November next; the estimated quantity being about 12,000 gallons.

The Tar can be taken from the tanks on these works, or will be delivered free into the Contractor's barrels, into trucks at Romford Station, Great Eastern Railway, as may be arranged hereafter. The tanks to be kept clear from time to time as directed.

Offers, marked "Tender for Surplus Tar," should be sent in on or before Friday, the 1st prox.

By order of the Board,
W. G. WILSHAW, Secretary.

South Street, Romford, Essex, Oct. 22, 1878.

ON SALE BY TENDER.

TWO Purifiers, 8 ft. square, with 8-in. Valves and Connections. All complete, and equal to new.

Apply to J. PICKUP, Gas-Works, West Houghton, LANCASHIRE.

ON SALE—A Station-Meter (with new Drum), capable of passing 10,000 cubic feet per hour, with Hydraulic Valves, Bye-Pass, &c.; 10-in. Connections. Has been removed to make room for one of larger capacity.

For particulars and price, apply to GEORGE NEWTON, Gas-Meter Manufacturer, Union Street West, OLDHAM.

TO GAS-METER MAKERS.

THE Southport Corporation invite TENDERS for the Supply of Dry GAS-METERS in Tin Cases and Wet GAS-METERS in Cast-Iron Cases, from 2 lights to 200 lights in size; stamped by Government, at a price per Meter and for a term of One, Two, or Three years.

Further particulars will be supplied on application to Mr. Robert Iddon, the Manager of the Gas-Works.

Sealed tenders, marked "Meters," to be sent to me not later than Wednesday, Nov. 27, 1878.

By order,
KEIGHLEY WALTON, Town Clerk.

THE HYDRAULIC MAIN ENTIRELY SUPERSEDED.

AN increased yield of gas, and of augmented illuminating power, is obtained by employing WHITE'S AUTOMATIC VALVE, and dispensing with the Hydraulic Main, the tar of which, as is well known, absorbs the rich constituents of the gas, consequently, diminishes alike the quantity and quality.

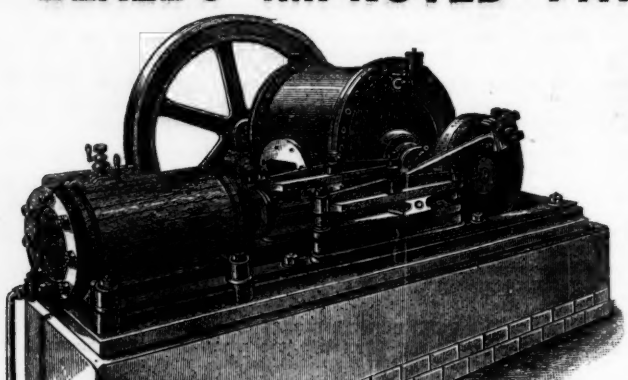
Further particulars, &c., upon application to WILLIAM WHITE, Gas-Works, Abersychan, MON.

A Pamphlet descriptive of the above method, post free, 6½d.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS

WITH

Wrought-Iron Spindles and ENGINES COMBINED.



SOLE MAKERS,

GEORGE WALLER & CO.

MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

Awarded Silver Medal at the Manchester Exhibition of the Society for the Promotion of Scientific Industry.

Phœnix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

TO GAS ENGINEERS.

D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

TAY WORKS. BONNINGTON, EDINBURGH.

Now Ready, price 28s., handsomely bound in Morocco, cloth sides, gilt edged and lettered,

THE FIRST VOLUME

OF

KING'S TREATISE

ON THE

SCIENCE AND PRACTICE OF THE MANUFACTURE & DISTRIBUTION

OF

COAL GAS.

EDITED BY THOS. NEWBIGGING, C.E., M.INST.C.E., AND W. T. FEWTRELL, F.C.S.

This Volume contains 460 pages of Letterpress, and is illustrated by 521 Woodcuts and 36 page and double-page Engravings, printed on Plate paper, and a full-page

COLOURED ENGRAVING OF THE BECKTON GAS-WORKS,

Forming a Frontispiece to the Volume.

ORDERS RECEIVED BY THE PUBLISHER,

WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

TO TAR AND AMMONIA DISTILLERS, &c.

THE Directors of the Red Hill Gas Company are prepared to receive TENDERS for the Surplus TAR and AMMONIACAL LIQUOR produced at their Works for One, Two, or Three years, from Jan. 1, 1879, or such other term as may be agreed upon.

Particulars, respecting quantity, &c., may be had on application to the Manager, at the Gas-Works, Red Hill, Surrey.

Tenders to be delivered, or sent so as to be received at the Gas-Works, not later than Saturday, the 2nd day of November next, endorsed "Tender for Surplus Tar and Ammoniacal Liquor."

By order of the Board,
C. READ, Manager and Secretary.

Gas Office, Brighton Road, Red Hill, Surrey, Oct. 17, 1878.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of the SHAREHOLDERS of the above Company will be held at the Offices of the Company, 30, Gracechurch Street, in the City of London, on TUESDAY, Nov. 12, 1878, at Three o'clock in the afternoon precisely, to receive the Directors Report and the Accounts of the Company for the half year ending the 30th day of June last, to declare a Dividend, and to transact the general business of the Company.

The Transfer Books will be closed from the 28th inst. to the 12th of November next, both inclusive.

By order of the Board,
ALFRED LASS, Secretary.

Offices, 30, Gracechurch Street, London, Oct. 22, 1878.

TO TAR CONTRACTORS.

THE Directors of the Kingston-upon-Thames Gas Company are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Works from Nov. 13, 1878, to June 30, 1879.

Particulars as to quantity, &c., may be obtained on application to Mr. Packham, Engineer, at the Works, Lower Ham Road.

Tenders to be sent in, addressed to the Chairman, not later than Tuesday, the 12th day of November, endorsed "Tender for Tar."

The Directors may require the Contractor to find security for the faithful fulfilment of his contract.

The Directors do not bind themselves to accept the highest or any tender.

W. A. FRICKER, Secretary.

TO CHEMICAL MANUFACTURERS, TAR DISTILLERS, AND OTHERS.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Gravesend and Milton Gaslight Company are prepared to receive TENDERS for the Purchase of their Surplus TAR and AMMONIACAL LIQUOR for One, Two, or Three years, from the 14th day of November next. A separate quotation should be named for each of the aforesaid periods.

The quantity of Tar will be about 40,000 gallons, and that of Liquor about 85,000 gallons in the year.

The Company will load into the Contractor's barges.

The average strength of the Liquor is about 11 ounces, but the Company will not guarantee that or any other strength, and tenders should be made per ounce of strength. Any further particulars can be obtained on application at the works, at Gravesend.

Tenders, marked "Tender for Tar, &c.," must be sent to my Office, 27, King Street, Gravesend, on or before Wednesday, the 6th day of November next.

The Company do not bind themselves to accept the highest or any tender.

TUFNELL SOUTHGATE, Secretary.

Gravesend, Oct. 25, 1878.

TRANSLATIONS of Engineering, Specifications, and Technical Publications from German, French, and Italian undertaken on moderate terms by G. S. BRUCE, St. Thomas's Crescent, NEWCASTLE-ON-TYNE.

FIRE-BRICKS AND RETORTS.

A Manufacturer is desirous of arranging an Agency for the Sale of these Goods in the London market with an old established London firm.

Apply, by letter only, to No. 501, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

Price 1s., on stout paper, in stiff paper cover,

ANALYSES OF SCOTCH COALS, CANNEL, SPLINT, SHALE, &c., USED in the MANUFACTURE of GAS. By WILLIAM WALLACE, Ph. D., F.R.S.E., F.C.S., &c., Public Analyst and Gas Examiner for the City of Glasgow.

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11, BOLT COURT, FLEET STREET, E.C.

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CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON (14 years Engineer and Manager of the largest of the Manchester Corporation Gas-Works) Mechanical and Consulting Gas Engineer, reports upon the condition and value of Gas-Works, supplies plans and specifications of all Apparatus appertaining to Gas-Works, and re-models existing Works.

Address Brooklyn, near Halliwell Lane, Cheetham Hill Road, MANCHESTER.

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SPECIAL ACCOUNTANT FOR GAS COMPANIES,

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Accounts analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, and have been universally approved.

The above forms are registered.

Water Companies Accounts also prepared and adjusted.

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Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

TO ENGINEERS & MANAGERS.—CLIFTON'S

PATENT COKE AND COAL BARROW

Is acknowledged to be the best Barrow in the Market.

For particulars, with Drawings and Prices, apply to the Sole Makers,

THORNELOE & COMPANY,
ENGINEERS AND CONTRACTORS,
57, BARBICAN, LONDON, E.C.

BOUCK & CO., LIMITED,

TAR DISTILLERS & MANUFACTURING CHEMISTS,

MILES PLATTING, MANCHESTER.

BRANCH WORKS, BLACKBURN.

BUYERS OF COAL TAR,
And Crude Products therefrom,
AMMONIACAL LIQUOR, &c.

HEBBURN MAIN GAS COALS.

T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,524 cubic feet per ton of 14¼-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9866 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

PRICES ON APPLICATION, EITHER F.O.B. OR BY RAIL IN TRUCK LOADS.

THE TYNE COAL COMPANY, LIMITED, OWNERS,
W. RICHARDSON, Fitter,
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TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

ABRAM COAL COMPANY,

WIGAN.

PROPRIETORS OF THE CELEBRATED

ABRAM CANNEL,

OTHERWISE KNOWN AS

NEW BOGHEAD;

ALSO OF

ARLEY MINE Four-feet, ORRELL,
And other Gas and House Coals.

ADDRESS:

23, THE ALBANY, LIVERPOOL.

CADZOW COAL COMPANY,

LIMITED.

Cadzow Collieries, Hamilton (Lanarkshire).
Office: 161, Hope Street, Glasgow.

Report on the Cadzow Ell Coal.

By Dr. W. WALLACE, F.R.S.E., F.C.S., Gas Examiner for the City of Glasgow.

I have made a careful chemical analysis and practical assay of an average sample of the Ell Coal from Cadzow Colliery, received on the 5th inst., from Messrs. The Cadzow Coal Company, Hamilton, and have obtained the following results:—

Analysis.

Volatile matters	Gas, tar, &c.	34·03	
	Sulphur	·04	46·12
	Water, at 212° Fahr.	12·05	
Coke	Fixed carbon	52·90	
	Sulphur	·03	53·88
	Ash	·95	
			100·00

Coke (dry) per ton of Coal, 1205 lbs., or 10 cwts. 3 qrs. 1 lb

Analysis of the Coke (Dry).

Carbonaceous or combustible matter	98·18
Sulphur	·06
Ash	1·76
	100·00
Specific gravity of the coal	1·250
Weight of a cubic foot in pounds	77½

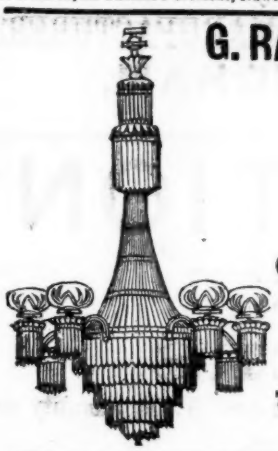
Practical Results.

Gas per ton of coal at 60° F. and 30 in. bar.	10,122 cub. ft.
Illuminating power in standard sperm candles by Argand jet, consuming 5 cubic feet per hour	16·76 candles.
Value of one cubic foot of gas in grains of sperm	402
Equivalent of a ton of coal in pounds of sperm candles	581
Durability of one cubic foot of gas by 5-inch flame	42 min. 45 sec.
Gravity of the gas, air = 1000	448

Remarks.

The sample tested consisted of a complete section of the seam, 5 ft. 6 in. in thickness. The results show that this Coal is well adapted for the manufacture of gas and coke, both being for soft coal of very fine quality. Of the many hundreds of coal samples I have tested, I have not hitherto had one with so small a proportion of ash as the Cadzow Coal. WILLIAM WALLACE.

Chemical and Gas Laboratory,
138, Bath Street, Glasgow, March 15, 1878.



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AND

GAS-FITTINGS,

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GAS COMPANIES.

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BIRMINGHAM.

Now ready, Second Edition, price 7s., by post 7s. 3d., the

GAS MANAGER'S HANDBOOK.

By THOMAS NEWBIGGING, M.I.C.E.

Orders to be sent to the Publisher,

WILLIAM B. KING,

11, BOLT COURT, FLEET STREET, LONDON, E.C.

NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to FRANK M'GEDY, Secretary.
126, Chancery Lane, London.

MR. EDWARD SANDELL,
Associate of the Society of Accountants in England, Publisher of the "Gas Companies Expenditure Journal,"
Begs to announce his REMOVAL from Skinner's Place, Size Lane, to
No. 2, GT. GEORGE STREET, WESTMINSTER.

W. LIDDALL,
Public Accountant,
15, UNION COURT,
OLD BROAD STREET, E.C.

Mr. ROBERT DEMPSTER, Sen.,
CONSULTING GAS ENGINEER,
Of Messrs. Robert Dempster and Sons, Rose Mount Gas Engineering Works,
ELLAND, near HALIFAX,
May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Our R. D., Sen., having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations, is both extensive and reliable.

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DIRECT FROM THE
MARQUESS OF LONDONDERRY'S COLLIERIES,
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OFFICES AND WAREHOUSE: 41, OSWALD STREET, GLASGOW.
WROUGHT-IRON TUBES AND FITTINGS
FOR GAS, STEAM, AND WATER.
Hot Water Tubes, Core Bars, Lap-welded Iron Boiler Tubes.
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Brass and Gun-Metal Fittings, Valves, Cutting and Screwing Tools, &c.

IMPROVED
COMPENSATING GAS-METER.
HUNT'S PATENT.

This Meter supplies a want long felt, by putting an end to the loss sustained by Gas Companies through the overworking of their Meters.

These Meters can now be supplied in either TIN-PLATE or CAST-IRON CASES, and OLD METERS converted to this plan. GAS COMPANIES and CORPORATIONS will find it to THEIR ADVANTAGE to adopt these Meters.

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"I am able to report that the Meters have given in each test most satisfactory results."—*Mr. H. Sporne, City of London Meter Inspector.*
"I consider the arrangement is a great improvement upon the Meters in present general use."—*Mr. T. Jackson, Meter Inspector, Birmingham.*
"I would observe from the results of my testings that the Meters are a great improvement on the ordinary Wet Meters in general use."—*Mr. H. Airey, Meter Inspector to the Metropolitan Board of Works.*

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JOHN BENT & SON,
WET AND DRY GAS-METER AND GAS APPARATUS MANUFACTURERS,
BELL BARN ROAD, BIRMINGHAM.
Established 1830.

GAS PURIFICATION
BY
OXIDE OF IRON.
COOKE BROTHERS

Beg to draw the attention of Gas Companies to the following certificate, relative to the quantity and quality of their Oxide, from the Assistant Surveyor of the County of Donegal:—

"*Londonderry, Oct.* 12, 1878.

"I have examined some of the deposits of iron ore in the following localities in the county of Donegal, over which Messrs. Cooke Brothers hold exclusive royalties for raising the ore—namely, several townlands in the Barony of Kilmacrenan, including the estate of Viscount Southwell, in the Barony of Raphoe, the estates of Sir Samuel Hayes and Colonel Montgomery, in the Barony of Ennishowen, several townlands on the estate of Mr. Newton—and I certify that the several estates are rich in Oxide; that the ore is of a very good quality, such as is usually shipped from this county; that the districts, which are very extensive, are capable of producing a large supply; in fact, the supply of ore on these estates is practically inexhaustible.

(Signed) "PHILIP M'LAUGHLIN, *Assistant County Surveyor.*"

COOKE BROTHERS beg to state they are also in possession of several other exclusive sources of supply, independent of those included in the above certificate.

26, 27, *and* 28, *Fenchurch Street, London, E.C., Oct.*, 1878.

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

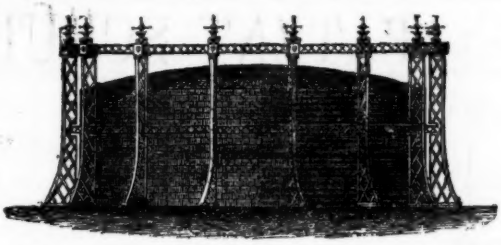
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS.

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



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LIMITED,

TIPTON, STAFFORDSHIRE.

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GAS ENGINEERS, IRONFOUNDERS, &c.,

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GAS OR WATER WORKS;

ALSO

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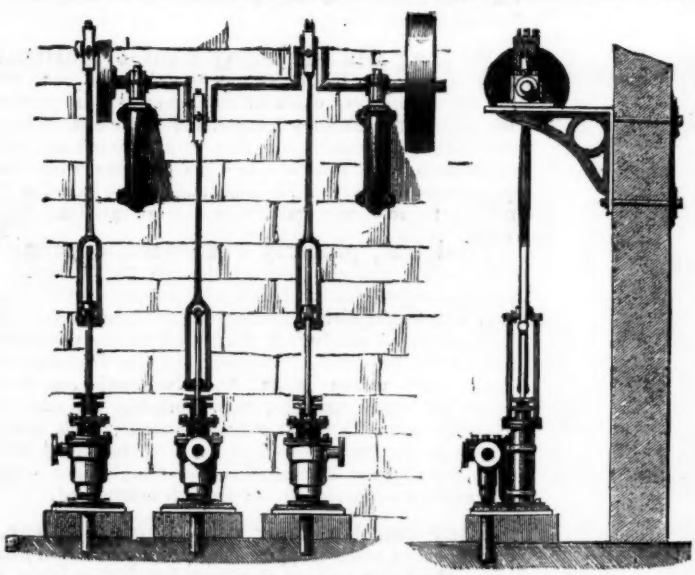
Hydraulic Engineers,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.

For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction.

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.

Illustrated Catalogues sent post free on application.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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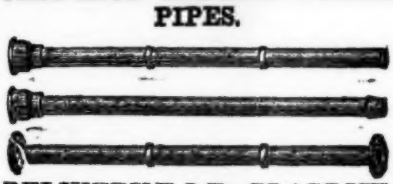

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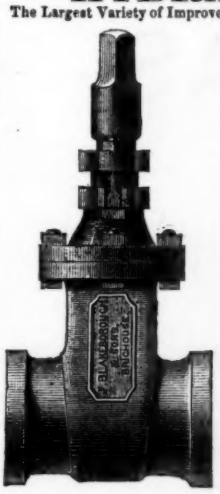

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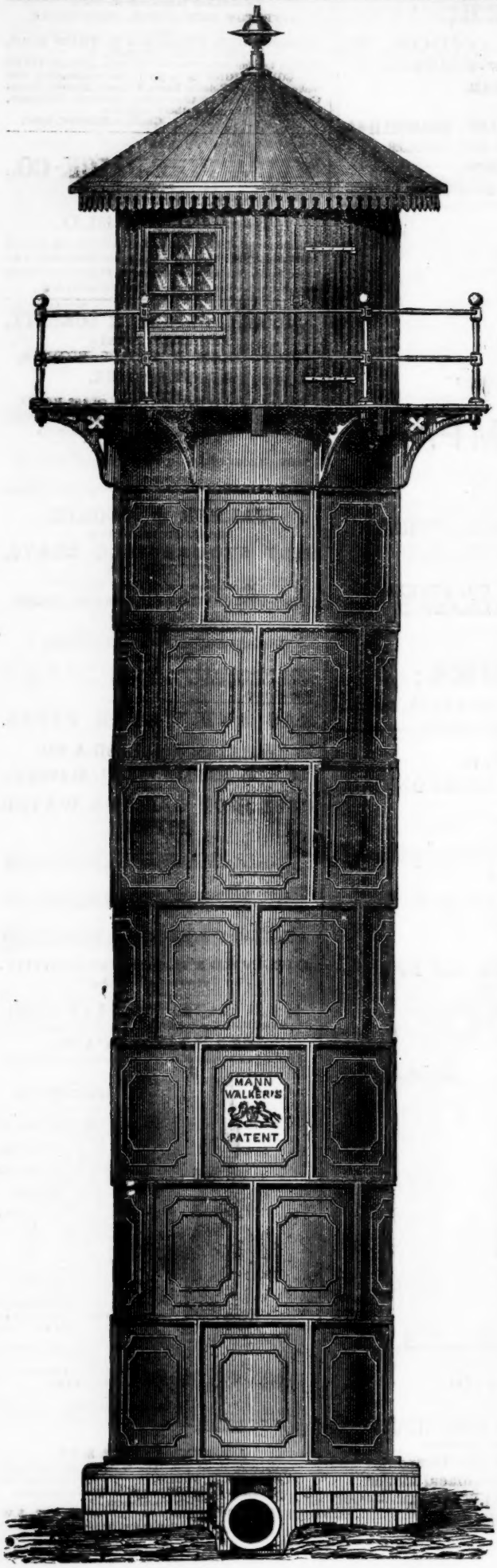

C. & W. WALKER,
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MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im-portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

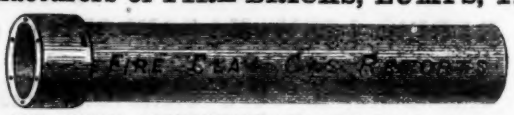
Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,



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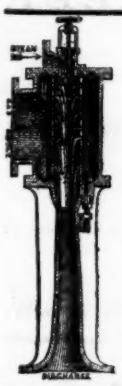

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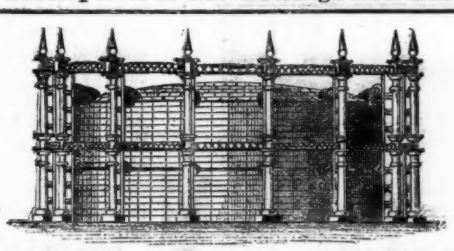

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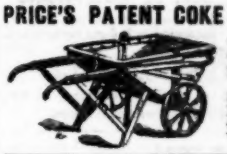

effecting a great saving of time, labour, and expense.

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The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

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Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead Colour.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
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All other Colours made to order.

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A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

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LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,330 cubic feet of 32·5-candle gas per ton.

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GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

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The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

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Established 1840.

DEAN'S PRIMROSE GAS COALS.

South Metropolitan Gaslight and Coke Company, London, July 12, 1878.

The Owners of the Dean's Primrose Colliery.

Dear Sirs,—I have much pleasure in stating that this Company have regularly used your Coals for more than thirty years, and that in all essential particulars they give the most satisfactory results.

The yield of Gas is from 9700 to 9800 feet per ton, of full 16 candles illuminating power, tested by the London Referees Standard Burner; and the Coke is of very good quality, while the quantity is about 40 bushels to the ton of Coal.

I consider Dean's Primrose Coals to rank amongst the first-class Gas Coals from the Durham Coal-Field.

Yours truly, GEORGE LIVESEY.

These Coals are also used by The Gaslight and Coke Company (London), and other English and Foreign Gas Companies.

Steamers loaded with quick despatch in the River Tyne.

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HOLMSIDE GAS COALS.

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At the request of Mr. Hedley, the owner of the Holmside Colliery, I have much pleasure in stating that, for about ten or twelve years past, this Company has taken at least half of its supply of Newcastle Coal from him. I can, therefore, confidently bear testimony to the good quality of the Holmside Coals, and consider they are equal to the best of the Newcastle Coals, in proof of which I may state that this year we are using those Coals exclusively, that the yield of Gas is from 9700 to 9800 feet per ton, and that the quality of the Gas, without any admixture of Cannel, is over 16 candles, as tested by the officer appointed by the Metropolitan Board of Works, using the London Gas Referees test.

The Coke is of excellent quality, and in quantity amounts to about 40 bushels from a ton of Coal.

The annual consumption of Coal amounts to about 75,000 tons.

GEORGE LIVESEY, Engineer and Secretary.

P.S.—I am at this date, Feb. 15, 1875, still using Holmside Coals as largely as ever, and am quite as well pleased with them as when I gave the above certificate.

GEORGE LIVESEY.

We are this year, 1878, using 60,000 tons of Holmside Coal. GEORGE LIVESEY.

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FUEL-MACHINE, for Compressing Breeze and Tar.

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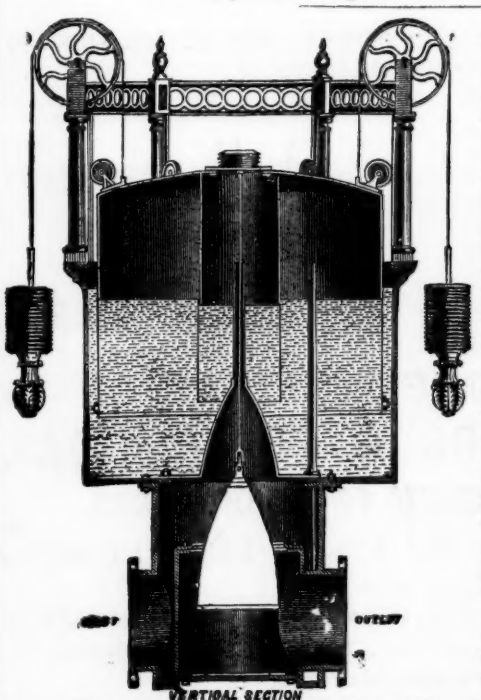
Beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

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REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

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The Silber Tubulated Gas-Burner.

The *World* says: "The light given by these Burners, besides being abundant in quantity, is almost like sunlight in its quality, so that it produces the same spectrum when refracted through a prism, and allows even the most delicate shades of colour to be distinguished."

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The Silber Tubulated Gas-Burner, with Opal Shade and Cup and Governor attached.

The *London Medical Record* says: "This uniform blending of the air with each part of the flame results in rendering it pure and white, and very considerably lessens the blue colour, which is significant of waste, and which is very plainly visible at the base of all imperfect lights. The creation and the maintenance of this white light—not yellow light—is a proof of perfect combustion.

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The Silber Bat's-wing Gas-Burner

The *Sanitary Record* says: "Mr. Silber's improvements render it possible to eliminate, as far as is practicable, the sulphuric acid due to the incomplete combustion of impure gas."

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S. C. & SONS undertake the entire erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the supplying and laying of MAINS.

They make a speciality of supplying every requisite whatever for Gas-Works, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.

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DESCRIPTION OF MORRIS & CUTLER'S PATENT CONDENSER.—The Condenser may consist of pipes arranged in tiers, or in any other form most convenient to the site available, each tier being connected with special connections, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. The Condenser itself may form the support for a high-level cistern. By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control. The Condenser may be seen in operation at the Brentford Gas-Works.

For further Particulars, apply to Mr. P. MORRIS, GAS-WORKS, BRENTFORD, or to S. CUTLER & SONS, PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), LONDON, E.

THE

STANDARD WASHER AND SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]

Some of the advantages claimed for this Apparatus are as follow:—

The Exposing of a large Amount of Effectually-wetted Surface (which is continually reproduced) to act upon the Gas.
Unerring Regularity in the Distribution of the Liquor.
Saving of Expense in Providing and Exchanging Scrubbing Material—none being required.
Economy of Space, thus enabling the Apparatus to be protected from the Weather.
Economy of First Cost and of Maintenance.
It works without Pressure.
It is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

Applications for Prices, &c., to be made to

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LONDON, 1851; NEW YORK, 1853 PARIS, 1855. COMBINING ALL THE LATEST IMPROVEMENTS, LONDON 1862; DUBLIN, 1865; PARIS, 1867

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